AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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NASA SP-7011(40)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA Information System during July 1967

Scientific and Technical Information Division
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. AUGUST 1967

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INTRODUCTION

Aerospace Medicine and Biology is a continuing bibliography which, by means of periodic supplements, serves as a current abstracting and announcement medium for references on this subject. The publication is compiled through the cooperative efforts of the Aerospace Medicine and Biology Bibliography Project of the Library of Congress (LC), the American Institute of Aeronautics and Astronautics (AIAA), and NASA. It assembles, within the covers of a single bibliographic announcement, groups of references that were formerly announced in separate journals, and provides a convenient compilation for medical and biological scientists. Additional background details for this publication can be found in the first issue, NASA SP-7011, which was published in July, 1964. Supplements are identified by the same number followed by two additional digits in parentheses.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis will be placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. The contents of this issue are comprised of abstracts that were prepared by the three contributing organizations.

Each entry consists of a standard citation accompanied by its abstract. It is included in one of three groups of references that appear in the following order:

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c. LC entries identified by a number in the A67-80000 series.

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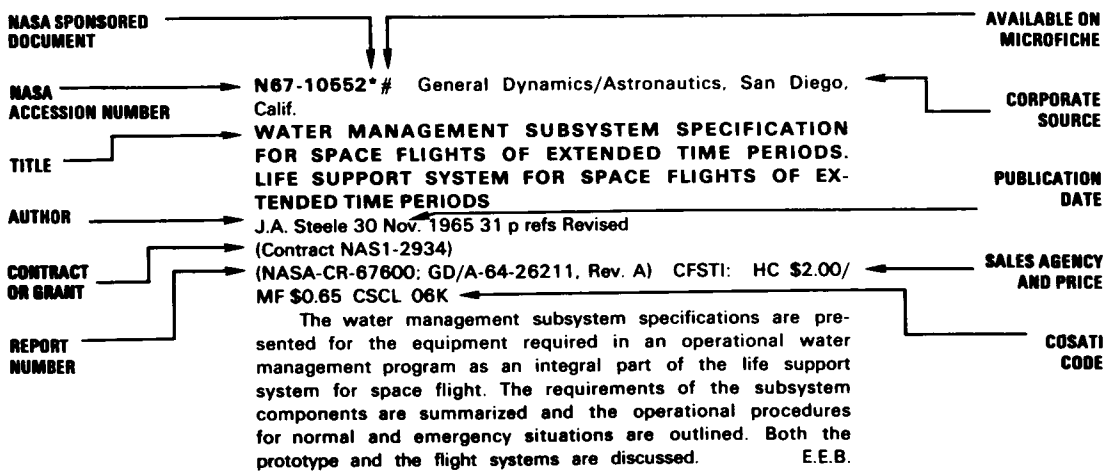
TYPICAL CITATION AND ABSTRACT



AEROSPACE MEDICINE AND BIOLOGY

a continuing bibliography AUGUST 1967

STAR ENTRIES

N67-25120# Naval Personnel Research Activity, San Diego, Calif.
A PERFORMANCE-ORIENTED ELECTRONICS TECHNICIAN TRAINING PROGRAM. II. INITIAL FLEET FOLLOW-UP EVALUATION OF GRADUATES
Nicholas H. Van Matre and John H. Steinemann Dec. 1966 32 p refs
(STB-67-15; AD-647553) CFSTI: HC $3.00/MF $0.65

In January 1964, the Navy Training Research Laboratory (NTRL) was assigned responsibility for developing, conducting and evaluating an experimental Electronics Technician (ET) training program. The general goals of this program were: (1) To train men whose aptitudes were lower than those typically qualified for ET A School, (2) to train them in a shorter period of time, and (3) to train them so that their skills would be more immediately useful on the job. This report describes an evaluation of the graduates from the first two classes of the experimental ET training course after they had served six months in the fleet. Evaluation instruments included actual performance tests, rating scales, interviews, proficiency rankings, and written tests. The results of the evaluation indicated that the experimentally trained ETs were performing satisfactorily in the fleet with overall proficiency not significantly different from that of a comparison sample of concurrently trained ET A School graduates. Author (TAB)

N67-25135 Federal Aviation Agency, Oklahoma City, Okla. Office of Aviation Medicine.
EVALUATION OF VARIOUS PADDING MATERIALS FOR CRASH PROTECTION
John J. Swearingen Dec. 1966 13 p ref
(AM-66-40; AD-647048) CFSTI: HC $3.00/MF $0.65

Thirty-seven different materials and combinations of materials were impacted with an instrumented dummy head at 15 ft/sec and at 30 ft/sec. Peak g forces, rise times, and deceleration durations were determined for both impact velocities on each test specimen and compared to base line impacts on the rigid base structure to determine the degree of energy attenuation of each type of padding. As might be expected there was a progressive decline of peak g force with increased thickness of padding materials. None of the 1/4 inch, 1/2 inch, or 3/4 inch materials tested at 30 ft/sec and only one of the 1 inch materials had sufficient energy attenuation to bring the peak g force even close to survivable limits while all materials tested of 2 inch thickness or over reduced the impact force of 30 ft/sec impacts to 300g or less. At 15 ft/sec impact velocities all materials tested of 1 inch thickness and over and at 30 ft/sec materials of 2 inch thickness and over would probably offer some protection against fatal head injury. However, since in commercial crashes head impact velocities may be as high as 50 ft/sec and it is important that the passengers remain conscious to escape ensuing fire and smoke, padding per se (even six inches thick) is insufficient. A combination of deforming 'metal' to dissipate energy and firm padding to distribute pressure forces over the contour of the facial bones may be used successfully in preventing head injury and/or unconsciousness. Author (TAB)

N67-25139# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
A SYSTEM FOR THE CONTINUOUS INFUSION OF ALPHA-CHLORALOSE ANESTHETIC Final Report, Dec. 1964-May 1965
Robert E. Van Patten Sep. 1966 14 p
(AMRL-TR-66-136; AD-647158) CFSTI: HC $3.00/MF $0.65

The development of a system designed to permit semi-automatic and continuous infusion of the anesthetic agent alpha-chloralose to dogs is described. The apparatus was developed for use in studies of cardiovascular and renal functions under various environmental conditions. The device has proved to be practical and trouble-free and the simple design uses easily available materials. Author (TAB)

N67-25158*# Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N. Mex.
REPLICATION AND EXTENSION OF RAPID DECOMPRESSION OF CHIMPANZEES TO A NEAR VACUUM
Alfred G. Koestler, ed. Jan. 1967 107 p refs
(NASA Order T-39909-G)
(ARL-TR-67-2; AD-647034) CFSTI: HC $3.00/MF $0.65
CSCL 06C

Nine chimpanzees were decompressed from 179 mm. Hg (breathing 100% oxygen) to less than 2 mm. Hg in .8 second and remained at this altitude from 90 to 210 seconds. After recompression with 100 percent oxygen to 179 mm. Hg, the subjects were maintained at this pressure environment for 4 hours post decompression. Results of these tests, which were of replicatory nature, have substantiated previous findings that chimpanzees can survive sudden exposure to a near vacuum and recover within 4 hours to once again satisfactorily perform complex behavioral schedules on which they had had extensive training. One subject of questionable fitness expired following a 90-second exposure to a near vacuum. ECG, respiration, and skin temperature were recorded as a standard procedure from all subjects, only two of which were instrumented for EEG. All subjects demonstrated tachycardia immediately following decompression which was regularly followed by a rather sudden bradycardia. There was an initial drop in skin temperature immediately

after decompression with an ensuing gradual fall resulting in a total decrease of 1.7 to 2.0C. Visual inspection of the EEG as well as power spectral density computer analysis indicated the expected greater subcortical resistance to anoxia when compared to cortical responses. Evoked responses to stimulation of subcortical areas were used as indicators of excitability. Author (TAB)

N67-25183# School of Aerospace Medicine, Brooks AFB, Tex.
ENERGY METABOLISM OF RATS BORN AND RAISED IN LOW-PRESSURE PURE OXYGEN ENVIRONMENT, NOVEMBER 1964–OCTOBER 1966
William E. Pepelko Dec. 1966 11 p refs
(SAM-TR-66-113; AD-648129) CFSTI: HC $3.00/MF $0.65

Ten rats born and maintained in a pure oxygen environment at a total pressure of 210 mm. Hg absolute were placed individually in metabolism cages at 21 days of age and remained there for 6 weeks. They were compared with a similar group of ground-level controls. In addition, 6 rats maintained at altitude and 6 controls were sacrificed at 21 days of age to provide an initial estimate of whole-body energy. Growth rates did not differ significantly; however, overall digestibility was lowered in experimentals, 74.3% versus 79.5% for controls ($P < .001$), with even greater differences in protein digestibility, 65.5% versus 74.6% ($P < .001$). Although less fat was also digested by experimentals, 75.6% versus 81.4%, this difference was not significant. Net caloric intake for both groups was the same, however, as a result of increased food intake by experimentals. Calories given off as heat did not differ, suggesting similar metabolic rates. Carcass content of fat and protein, as a percentage of dry matter, did not differ for 21- or 63-day-old rats. The 21-day-old experimentals had a higher water content, 68.1% versus 65.6% for controls ($P < .05$). Calories/gram on a dry-weight basis showed no significant differences in either the 21- or 63-day group. Author (TAB)

N67-25325# Florida State Univ., Tallahassee. Statistics Dept.
MODELS FOR PAIRED COMPARISONS
W. A. Thompson, Jr. and Jagbir Singh Jul. 1966 16 p refs
(Contract Nonr-988(08); Grant NSF GP-3807)
(FSU-M115; ONR-TR-21; AD-639657) CFSTI: HC $3.00/MF $0.65

A central concept in this paper is that of linear model. A model is called linear if the frequency probability with which a subject reports the stimulus X_1 as greater than X_2 has the form H (t (X_1)-t (X_2)). Interrelations among various models for paired comparisons are studied. The Thurstone, Bradley–Terry, and Scheffe models are treated as special cases of the general linear model. It is shown that all of these special cases introduce a concept of 'psychological distance between stimuli.' The increase or decrease of the probability of detecting the larger stimulus for linear-models is shown to depend primarily on t rather than H. The uniqueness of the linear representation of a Bradley–Terry model is discussed. A final section proposes a general model allowing for the response of no apparent difference. Author (TAB)

N67-25327# Washington State Univ., Pullman.
VISUAL ACUITY IN MONKEYS: A MONOCULAR AND BINOCULAR SUBJECTIVE TECHNIQUE
Donald N. Farrer and Ernest S. Graham Holloman AFB, N. Mex., Aeromed. Res. Lab., Mar. 1967 20 p refs
(Contracts AF 29(600)-5390; AF 29(600)-67-C-0024)
(ARL-TR-67-8; AD-648548) CFSTI: HC $3.00/MF $0.65

A technique for obtaining monocular and binocular visual acuity measurements from rhesus monkeys is described. This procedure involves a back-lit screen and projection mechanism which presents stimuli varying in size between 0.5 and 10 minutes of arc. The subject is rewarded by pressing one of four levers based on a discrimination between four Landolt rings. Subjective visual acuity data (OS, OD, and OU) are presented for one subject. Author (TAB)

N67-25329*# Department of the Army, Fort Detrick, Md.
RECOVERY OF VEGETATIVE BACTERIA FROM ECCOFOAM FP AND DIATOMACEOUS EARTH
Dorothy M. Portner 25 Apr. 1967 5 p refs
(NASA Order R-35)
(NASA-CR-84214) CFSTI: HC $3.00/MF $0.65 CSCL 06M

An investigation was conducted to determine whether vegetative bacteria can survive the polymerization process of a plastic and survive for short periods thereafter in plastic or other materials. The work was qualitative because it has not been possible to determine the total number of viable microorganisms present inside a component. Since diatomaceous earth previously was found to offer protection for spores against dry heat, it also was included in the tests. The investigation was designed to include the following criteria: (1) a high concentration of vegetative cells incorporated in a solid to insure recovery if a reasonable percentage survive a specific time; (2) the use of a test organism that has relatively low survival in a dry state at room temperature; and (3) a test span of one to three weeks. Approximately a billion lyopholized powdered *Serratia marcescens* cells were used in the test. The bacteria were successfully recovered, and it is concluded that they can remain viable over an extended period while entrapped in a component. K.W.

N67-25330# Baylor Univ., Waco, Tex. Primate Behavior Lab.
AN EXPLORATORY STUDY IN COMPARATIVE PSYCHOPHYSIOLOGY
William D. Thompson, Roger E. Kirk, and John C. Flynn Holloman AFB, N. Mex., Aeromed. Res. Lab., Sep. 1966 83 p refs
(Contract AF 29(600)-4923)
(ARL-TR-66-16; AD-648546) CFSTI: HC $3.00/MF $0.65

Psychophysiological reaction patterns to a single stress-learning task were studied in three species, the chimpanzee, the Java monkey and man. The learning task used was a series of oddity problems negatively reinforced by electric shock, while the psychophysiological channels employed were galvanic skin response, heart rate and respiratory rate. Findings indicate differences between species in autonomic reactivity to the stress task, but no significant differences in such reactivity as the learning process progresses. The data also suggests that when the Law of Initial Values holds, the Lacey autononomic lability score is a more sensitive measure of reactivity than is a difference score. On the other hand, when the Law of Initial Values does not hold, a difference score may be as sensitive as the autonomic lability score. Suggestions for future research in this area are made. Author (TAB)

N67-25331# Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N. Mex.
THE EFFECT OF MONOMETHYLHYDRAZINE WITH AND WITHOUT PYRIDOXINE ON OPERANT BEHAVIOR OF PRIMATES
Thomas L. Wolfle, Glayde D. Whitney, and Paul Y Batson Feb. 1967 33 p refs
(ARL-TR-67-6; AD-648547) CFSTI: HC $3.00/MF $0.65

Ten macaque monkeys were trained on a complex behavioral program containing both aversively and appetitively rewarded tasks. A two-phase experimental design was utilized. During Phase I all subjects were repeatedly exposed at one of two dose levels of monomethylhydrazine and pyridoxine HCl. The monomethylhydrazine (i.p.) and pyridoxine HCl (i.m.) injections were administered simultaneously. Phase II was a replication without pyridoxine HCl. Data included behavior on a Sidman avoidance schedule, FR(100:1) and three-stimulus oddity for food, as well as discrete avoidance with both visual and auditory cues. Gross clinical signs were noted.

Dose-response and temporal relationships were investigated. Appetitive responding was found to be most sensitive and the differences between Phase I and Phase II provide some evidence that pyridoxine HCl may be effective as a therapeutic agent in situations involving exposure to low levels of monomethylhydrazine. Author (TAB)

N67-25340# Human Factors Research, Inc., Santa Barbara, Calif.
GEOGRAPHIC ORIENTATION IN AIRCRAFT PILOTS: ACHROMATIC DISPLAY OF COLOR-CODED CHARTS
William E. Osterhoff, William K. Earl, and James J. McGrath Nov. 1966 53 p refs
(Contract Nonr-4218(00))
(TR-751-8; AD-648331) CFSTI: HC $3.00/MF $0.65

Geographic orientation performances of four groups of pilots were measured under conditions of simulated, VFR flight. The first group used a full-color standard Sectional chart. The second group used a graytone version. The third group used a black-and-white line version. The fourth group used a blank version. Pilots who used the achromatic graytone and line charts performed significantly poorer than pilots who used color charts, but better than pilots using blank charts. The main reasons for the inferiority of the achromatic charts were: (1) categories of topographic information were difficult to differentiate; (2) reliance on natural landmarks had to be abandoned in favor of reliance on cultural landmarks; (3) pilots had to spend too much time studying the charts during flight; and (4) the vertical development of terrain was poorly portrayed. It was concluded that navigation display systems which lack color capability cannot effectively employ existing color-coded aeronautical charts. Specially designed achromatic graphics will be required for such systems. Author (TAB)

N67-25385# Union Carbide Nuclear Co., Oak Ridge, Tenn.
A MINIATURIZED RADIOTELEMETRY DEVICE FOR MONITORING TEMPERATURES
E. W. Pipes 13 Dec. 1966 42 p refs
(Contract W-7405-ENG-26)
(Y-1568) CFSTI: HC $3.00/MF $0.65

Technological advancements in telemetry circuits and components, especially in the field of miniaturization, provide means of measuring variables under conditions which have formerly been considered impractical or impossible. The technical aspects of a biotelemetry system for measuring the temperature of a small mammal without the use of restraining wires, and a radiotelemetry system for measuring the temperature of a moving machine member or work-piece. Author (NSA)

N67-25392# Battelle-Northwest, Richland, Wash.
ELECTRICAL ANESTHESIA TECHNIQUES
R. L. Wilbur Nov. 1966 28 p refs
(Contract AT(45-1)-1830)
(BNWL-317) CFSTI: HC $3.00/MF $0.65

An attempt to clarify the terminology and to correlate the work of many investigators in electrical anesthesia is presented. Topics discussed are basic definitions of electrical sleep, narcosis, and anesthesia; electronics; electrodes; and physiological responses. NSA

N67-25397# Argonne National Lab., Ill. Lab. Animal Information Center.
LABORATORY ANIMAL SCIENCE—A REVIEW OF THE LITERATURE FOR JANUARY–MARCH 1966
Robert J. Flynn Jun. 1966 55 p refs
(Contract W-31-109-ENG-38)
(ANL-7300) CFSTI: HC $3.00/MF $0.65

This annotated bibliography contains 123 references to journal articles on laboratory animal management, technology and medicine. A species index is included. NSA

N67-25405# School of Aerospace Medicine, Brooks AFB, Tex.
OXYGEN DEFICIT INCURRED DURING HYPOXIA AND ITS RELATION TO EXCESS LACTATE Final Report, 28 Jan.–5 Oct. 1965
Stephen M. Cain Dec. 1966 16 p refs
(SAM-TR-66-107; AD-648416) CFSTI: HC $3.00/MF $0.65

The oxygen deficit incurred during hypoxia was compared to the peak excess lactate (XL) level in order to see if any consistent relationship existed when a known oxygen limitation was imposed. Twelve anesthetized dogs, in which ventilation was held constant, breathed 9.1% O2 in N2 for 10, 20, and 30 minutes. Oxygen uptake was measured every 10 minutes during a control period, hypoxia, and a recovery period. Oxygen content and tension of systemic and pulmonary arterial blood were measured at the end of each of these periods. Excess lactate was calculated from blood lactate and pyruvate levels measured during the control period, the last minute of hypoxia, the first minute of recovery, and at intervals thereafter. Depletion and repletion of oxygen stores were estimated by assuming values on a body-weight basis for functional residual volume, body water, total blood volume, and its distribution. True O2 deficit and true excess O2 of recovery were thus calculated and compared to each other and to peak XL values. Excess O2 uptake measured during recovery, which is the oxygen debt as usually measured, never was as great as the oxygen deficit incurred during hypoxia, and bore little consistent relationship to peak XL. The true O2 deficit, on the other hand, had a coefficient of correlation of .781 when compared with peak XL. Author (TAB)

N67-25409# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
EFFICACY OF ALKALI-SUPEROXIDE BEDS FOR BACTERIA REMOVAL FROM AIR
S. J. Burdick and R. C. Evans Dec. 1966 90 p
(Contract NOw-62-0604-c)
(APL-TG-879; SLS-307-66; AD-648309) CFSTI: HC $3.00/MF $0.65

The feasibility and chemical behavior of potassium superoxide in thin-bed canisters were investigated. An experimental parametric study of the four variables of particle size flow rate, relative humidity, and bed depth was completed. General laboratory observations for thin-bed canisters showed: (1) Increasing relative humidity resulted in increasing carbon dioxide absorption and oxygen generation; (2) Increasing flow rate resulted in decreasing carbon dioxide absorption and increasing oxygen generation; (3) Increasing bed depth resulted in increasing carbon dioxide absorption and decreasing oxygen generation; (4) Increasing mesh (surface area) resulted in increasing oxygen generation but had no apparent effect on carbon dioxide absorption; The efficacy of the thin-bed superoxide canister toward bacteria (Serratia Marcescens) in an air stream was shown to be predominantly a physical effect. Tests were conducted with an empty canister (control), an inert canister (CaSO4 or sand), and a potassium superoxide canister. The physical effect of the inert canister removed 63 to 84% of the bacteria from the air stream. The superoxide canister exhibited the same physical effect, while a chemical effect removed an additional 6 to 16% of the bacteria. The filtration effect of the thin-bed superoxide canister toward bacteria was considerably greater than any chemical effect. Author (TAB)

N67-25468# California Univ., Livermore. Lawrence Radiation Lab.
THERMOLUMINESCENT MATERIALS FOR PERSONNEL MONITORING IN GLOVED BOX OPERATIONS
D. E. Jones, K. F. Petrock, and D. H. Denham *In its* Hazards Control Aug. 1966 p 28–36 refs (See N67-25461 13-34)

Several mechanical configurations of LiF and BeO that have been studied for application to personnel dosimetry problems are discussed. The choices of the systems were based on availability and the desire to retain the well established attributes of LiF TLD powder. NSA

N67-25469# California Univ., Livermore. Lawrence Radiation Lab.

Zn^{65} CONTENT IN 90-IN. CYCLOTRON WORKERS AT LIVERMORE

A. L. Anderson and C. T. Schmidt *In its* Hazards Control Aug. 1966 p 37–40 refs (See N67-25461 13-34)

The presence of ^{65}Zn in cyclotron operators and related support group personnel was detected as a result of routine measurements using a whole-body counter. Scans on 16 people revealed internal deposition of ^{65}Zn ranging from 2 to 850 nCi. A differential scan on one man indicated that the primary mode of entry into the body is inhalation and that the initial activity assumes a uniform distribution throughout the body. NSA

N67-25483* Sandia Corp., Albuquerque, N. Mex. Planetary Quarantine Dept.

A RATIONAL MODEL FOR SPACECRAFT STERILIZATION REQUIREMENTS

J. P. Brannen Apr. 1967 34 p refs

(NASA Order R-09-019-040)

(NASA-CR-83799; SC-RR-67-256) CFSTI: HC$3.00 CSCL 06T

The COSPAR requirements that the probability of spacecraft contamination not exceed 10^{-4} demand an extrapolation of empirical data through four population decades beyond the range of possible measurement. The inherent dangers in such extrapolation prompts the introduction of maximum rationality in the models used. Rationality is introduced through chemical reaction kinetics, the model is tested against empirical data, and techniques for computation are investigated. Author

N67-25572# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).

THE TRANSITION BETWEEN TWO FORMS OF BACTERIOPHAGE ΦX174 DIFFERING IN HEAT SENSITIVITY AND ADSORPTION CHARACTERISTICS

J. F. Bleichrodt and E. R. Van Abkoude Oct. 1966 19 p refs (MBL-1966-9; TDCK-46888) CFSTI: HC$3.00/MF$0.65

If cells of the bacterium *Escherichia coli* C infected with bacteriophage ΦX174 are lysed artificially in the cold, the phage obtained is relatively heat resistant at temperatures around 65°C and unable to absorb to host cells at 4°C. At 37°C the phage particles become more thermolabile with respect to inactivation at 65° and, concomitantly, obtain the ability to adsorb to *E. coli* C in the cold. A minor fraction remaining thermoresistant at 37°C does not adsorb to host cells even at this temperature. Optimum conditions for the transition of the resistant into the sensitive form in phosphate buffer are 37°C, pH $\geq$ 7 and a concentration of phosphate $\geq$25 mM. At lower pH and high titers of phage the thermosensitive form changes partly back into the thermoresistant one. Author

N67-25577 Chemical Lab. RVO-TNO, Rijswijk (Netherlands).

THE INFLUENCE OF THE WATER VAPOR ADSORPTION ON THE PROTECTION AFFORDED BY WHETLERITE AGAINST CHEMICAL WARFARE AGENTS, PART II

J. G. T. Van Aken Dec. 1966 34 p refs

(Rept.-1966-23; TDCK-47676)

The pore structure of whetlerite was determined from nitrogen adsorption and desorption isotherms. The pore size distribution of narrow slit shaped pores was calculated from the adsorption branch with the t-method. The Barrett-Joyner-Halenda method was used to determine the pore size distribution of the wider pores. The two methods give a complete pore structure picture up to a pore width of 1000 Å. Most of the pore volume consists of narrow pores in which molecules of chemical warfare agents are strongly adsorbed, while the rest consists of wider pores through which the molecules are transported to the narrow pores. Water vapor adsorption is essentially a pore filling process. When the relative pressure is increased, the wider pores are filled successively. Water vapor isotherms of samples impregnated, nonimpregnated, and nonimpregnated and treated in hydrogen at 1100°C were measured. The number of hydrophilic sites decreases in this series in the order mentioned, causing a shift of the steep part of the water vapor isotherm to higher relative pressures. Water vapor adsorption at a relative humidity under 90% can be decreased by removing hydrophilic substances. Author

N67-25589 Royal Air Force, Farnborough (England). Inst. of Aviation Medicine.

HEAD VENTILATION

J. M. Clifford London, Flying Personnel Res. Comm., Apr. 1965 30 p refs

(FPRC/1237)

Experimental studies of different types of head ventilating prototype equipment, and two head ventilating devices were sent to aircrew for evaluation in the field under summer climatic conditions in the Eastern Mediterranean and North African littoral. Results indicate that significantly more aircrew think that head ventilation is essential or desirable than think it unnecessary, or have no opinion, at $p = .003$. The Canberra PR9 navigators need for head ventilation differs from the requirement of the other aircrew who undertook this trial. It was significantly different; fewer navigators thought head ventilation essential or desirable, at $p = .001$. R.Ll.

N67-25590 Royal Air Force, Farnborough (England). Inst. of Aviation Medicine.

REGIONAL VENTILATION AND PERFUSION OF THE LUNG DURING GRAVITATIONAL STRESS MEASURED WITH RADIOACTIVE XENON

D. H. Glaister London, Flying Personnel Res. Comm., Apr. 1965 36 p refs

(FPRC/1236)

Four basic techniques were employed to allow regional ventilation and perfusion of the lung during gravitational stress to be measured. The distribution of radioactive gas was then detected by means of external counting after the isotope had been inhaled or injected intravenously. Modifications of the methods employing ^{133}Xe were used in the present study to investigate the role of gravity in determining the extent of inequalities in the distribution of both ventilation and perfusion. The effect on ventilation of inflating an anti-g suit during acceleration was also studied because of the dramatic effect such inflation has on the development of lung collapse. R.Ll.

N67-25591 Royal Air Force, Farnborough (England). Inst. of Aviation Medicine.

SIGNAL VARIANCE AND ITS APPLICATION TO CONTINUOUS MEASUREMENTS OF E.E.G. ACTIVITY.

G. H. Byford London, Flying Personnel Res. Comm., May 1964 27 p refs

(FPRC/1224)

This analytical technique provides numerical values which may be used as objective measures of e.e.g. activities. The time scale of the analysis may be so chosen that an e.e.g. record of any duration can be represented by a single graph, on which to the same scale, other associated physical or physiological variables may be recorded. A means is provided for relating time points on the original record with the same time points in the analysis. The method is illustrated by analyses of e.e.g changes (a) brought about by anoxia following rapid decompression (b) during sleep, and (c) following the injection of pentothal and the insertion of sphenoidal electrodes. It has also been used in studies of hyperventilation, changes resulting from increased gravitational stress on a human centrifuge, and of the effect of anaesthetics on arousal patterns in animals. Author

N67-25597 Royal Air Force, Farnborough (England). Inst. of Aviation Medicine.
ANOMALIES OF THE HUMAN CORNEORETINAL POTENTIAL
G. H. Byford London, Flying Personnel Res. Comm., May 1964 24 p refs
(FPRC/1223)

The bitemporal corneoretinal potential has been examined in order to assess in individuals, the validity of the hypothesis that the potential reflects faithfully, movements of the eyes. Using two DC-130c/s systems, recordings were taken simultaneously from bitemporal electrodes and from a photoelectric contact lens device the fidelity of which had previously been established. The potential was found sometimes to be dependent on the angular velocity of the eye, and not always to reflect faithfully either the direction or amplitude of an ocular deflection. The corneoretinal potential technique possesses the merit of simplicity, gives approximate numerical values when the waveform is known in advance, and may be used to give a general picture of the nature of gross eye movements. However, the existence of a trace deflection is no guarantee that an eye movement took place and it is by no means certain that movements of the eyes will be accompanied by corresponding changes in the recorded trace. Author

N67-25600 Royal Air Force, Farnborough (England). Inst. of Aviation Medicine.
THE EFFECT OF POSTURE ON THE DISTRIBUTION OF VENTILATION AND PERFUSION WITHIN THE LUNG MEASURED WITH ^{133}XENON
D. H. Glaister London, Flying Personnel Res. Comm., Apr. 1965 17 p refs
(FPRC/1238)

The distribution of ventilation and perfusion was measured in erect, supine and inverted seated man using xenon 133. Ventilation became uniform on changing from erect to supine, and on inversion the lung apex became better ventilated than the lung base. These findings were explicable only on the basis of the changing gravitational field and could not have been secondary to concurrent changes in total ventilation, or distribution of blood flow. The distribution of perfusion became more uniform on changing from erect to supine, and on inversion the lung apex became better perfused than the lung base, though the overall inequality was less than in the erect lung. This was explicable on a basis of the disappearance of the zone of zero flow in the lung and an increase in the proportion of the lung volume subject to passive distension flow change. Wash-in and wash-out of xenon 133 were compared and the wash-in found to be a more sensitive index of regional ventilation. Possible reasons for this difference are discussed. R.Ll.

N67-25622# Aerospace Medical Div. Aeromedical Research Lab. (6571ST), Holloman AFB, N. Mex.
CONFIRMATION OF THE CHIMPANZEE STEREOTAXIC ATLAS: ELECTRODE PLACEMENTS IN ONE ANIMAL, AUGUST 1965–JANUARY 1967
Donald F. Buxton and Martin L. Reite Feb. 1967 11 p
(ARL-TR-67-5; AD-647289) CFSTI: HC$3.00/MF$0.65

Histological localization of nine electrode implantations in a chimpanzee tends to confirm the accuracy of A Stereotaxic Atlas of the Chimpanzee Brain (Pan Satyrus) by DeLucchi, Dennis and Adey. Sources of error resulting in inaccurate placement are discussed. Author (TAB)

N67-25641*# George Washington Univ., Washington, D. C.
SCIENTIFIC PUBLICATIONS OF THE BIOSCIENCE PROGRAM DIVISION. VOLUME I: BEHAVIORAL BIOLOGY
Frances Hong, L. A. Kulp, and M. F. Werber 20 Mar. 1967 94 p refs
(Grant NSR-09-010-027)
(NASA-CR-62040) CFSTI: HC$3.00/MF$0.65 CSCL 06C

Bibliographical data are presented on the citations representing the publication efforts of the grantees and contractors of the Bioscience Program Division. Literature citations are listed chronologically and according to the authors' surname. To provide access to these references, both an author index and permuted title index are included. Laboratory addresses of the senior authors are provided. Publication sources are analyzed, and publication frequencies of the major subject fields are graphically represented. Four other volumes offer similar information on Environmental Biology, Exobiology, Physical Biology, and Planetary Quarantine and Bioscience Communications. M.G.J.

N67-25642*# George Washington Univ. Washington, D. C.
SCIENTIFIC PUBLICATIONS OF THE BIOSCIENCE PROGRAM DIVISION. VOLUME II: ENVIRONMENTAL BIOLOGY
Frances Hong and L. A. Kulp 20 Apr. 1967 73 p refs (For Abstract See N67-25641 13-04)
(Grant NSR-09-010-027)
(NASA-CR-62041) CFSTI: HC$3.00/MF$0.65 CSCL 06C

N67-25650 Chemical Lab., RVO-TNO, Rijswijk (Netherlands).
STEREOSPECIFICITY OF HYDROLYTIC ENZYMES IN THEIR REACTION WITH OPTICALLY ACTIVE ORGANOPHOSPHORUS COMPOUNDS. III: THE INHIBITION OF ALIESTERASE, ACETYLESTERASE, CHYMOTRYPSIN AND TRYPSIN BY S-ALKYL P-NITROPHENYL METHYLPHOSPHONOTHIOLATES
H. L. Boter and A. J. J. Ooms Jan. 1967 12 p refs
(TDCK-47683; Rept.-1967-3) CFSTI: HC$3.00

Rate constants of the irreversible inhibition of aliesterase, acetylesterase, chymotrypsin and tryspin by racemic and enantiomeric forms of some S-alkyl p-nitrophenyl methylphosphonothiolates were measured. Of the esterases investigated acetylesterase showed the most pronounced stereospecificity. The stereospecificity pattern corresponded with that reported previously for acetylcholinesterase. In the case of chymotryspin an inversion of stereospecificity throughout the enantiomeric series of inhibitors was observed. Author

N67-25651# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
DECISION MAKING DURING PACED ARRIVAL OF PROBABILISTIC INFORMATION
A. F. Sanders and W. ter Linden [1966] 14 p refs
(IZF-1966-17; TDCK-47115) CFSTI: HC$3.00/MF$0.65

Four exploratory experiments are described in which the basic assumptions for decision making in probabilistic sequential tasks are tested. The assumptions are: (1) continuing revision of the likelihoodratio on the basis of incoming data, and (2) a fixed decision criterion on the basis of costs and payoffs. The results suggest that the decision criterion shifts from rather strict to quite risky as clear evidence is postponed, so that the criterion is certainly not fixed. The findings were not contrary to the idea of revision of the likelihoodratio. Author

N67-25661* Sandia Corp., Albuquerque, N. Mex. Planetary Quarantine Dept.
[SCOPE OF WORK FOR SCIENTIFIC AND TECHNICAL ASSISTANCE FOR THE PLANETARY QUARANTINE MISSION] Quarterly Report, Period Ending Mar. 31, 1967
Mar. 1967 20 p refs
(NASA Order R-09-019-040)
(NASA-CR-83829; QR-4) CSCL 06T

Systems studies and systems support activities are reviewed for scientific and technical assistance to a planetary quarantine mission. Quarantine objectives are cited, requirements modeling is explained, and sterilization models are described. Systems support activities focused on a contamination control study. S.P.

N67-25673*# Oregon State Univ., Corvallis.
SULFUR OXIDIZING CAPACITY OF CALIFORNIA DESERT SOILS
W. B. Bollen and Karen M. Byers 9 Mar. 1967 9 p refs Prepared for JPL
(Contracts NAS7-100; JPL-950783)
(NASA-CR-83817) CFSTI: HC $3.00/MF $0.65 CSCL 06M

Results of sulfur oxidation studies made with samples of six azonal California desert soils are presented. Experiment methods and characteristics of samples are discussed. One soil was slightly acid, one was neutral, and four were alkaline. After 30 days incubation all controls and sulfur treated soils were analyzed for pH and sulfate. Results are tabulated for the sulfur oxidizing capacity of the six desert soils and some selected arable soils. S.P.

N67-25675*# Naval School of Aviation Medicine, Pensacola, Fla.
AN ATAXIA TEST BATTERY NOT REQUIRING THE USE OF RAILS
Alfred R. Fregly and Ashton Graybiel 6 Dec. 1966 17 p refs
(NASA Order R-93)
(NASA-CR-83815; NAMI-985) CFSTI: HC $3.00/MF $0.65 CSCL 06N

Normative standards of performance on a battery of ataxia tests with the floor as a platform and employed routinely in the vestibular research program are reported. Significant decreases in performance with age and an apparent superior performance by males were found. The scores of bilateral and unilateral vestibular-defective individuals and of patients referred for testing because of symptoms of vertigo departed significantly from the normative standards. The usefulness of individual tests as well as of the test battery in clinical and research situations was made apparent. Author

N67-25677*# Naval School of Aviation Medicine, Pensacola, Fla.
CENTRIFUGATION OF THE WHITE-FRONTED CAPUCHIN MONKEY, *CEBUS ALBIFRONS* (HUMBOLDT)
James C. Knepton, Jr. 30 Dec. 1966 10 p refs
(NASA Order R-10-009-027)
(NASA-CR-83813; NAMI-997) CFSTI: HC $3.00/MF $0.65 CSCL 06C

In preparation for biological experiments aboard orbiting laboratories three *Cebus albifrons*, white-fronted capuchin monkey, were exposed to five headward-directed ($+A_z$) resultant linear acceleration stimuli aboard a centrifuge and their ECG's, skin temperatures, and breathing rates recorded. Marked tachycardia was noted at the start of the centrifugation, followed by bradycardia within 6 to 7 minutes at 7.5 g and within 1-1/2 minutes at 10.3 g. Concomitant with the onset of bradycardia, a loud squeal was usually heard. There were no significant temperature changes, and breathing rates did not vary from normal. Normal heart rate was restored upon cessation of centrifugation. It appears that the *Cebus* can withstand the acceleration of space travel and therefore will be a good experimental animal in that environment. Author

N67-25678*# Texas Univ., Austin. Defense Research Lab.
CONDUCT STUDIES OF AUDITORY INFORMATION PROCESSING EMPHASIZING THE APPLICATION OF SIGNAL DETECTABILITY THEORY TO THE AUDITORY SENSORY RESPONSES Semiannual Report, 1 Jun.–30 Nov. 1966; Quarterly Status Report, 1 Sep.–30 Nov. 1966
L. A. Jeffress 25 Jan. 1967 11 p
(NASA Order R-129; Contract Nonr-3579(04))
(NASA-CR-83812; QSR-10) CFSTI: HC $3.00/MF $0.65 CSCL 05H

Various investigations of auditory data processing emphasizing the application of signal detectability and theory to the auditory sensory responses are reported. Abstracted material is presented for a method of free response, detection performance and two parameters of the auditory stimulus, curves for miltilevel signals in a detection task, construction of a binaural electrical model, and performance of listeners and an artificial ear on a vigilance problem. Also briefly mentioned are studies of the effects of visual stimulus detection, signal detection and the width of critical bands, programming punched-card recording equipment, and construction of a binaural electrical model. S.P.

N67-25685 Entwicklungsring Sud, Munich (West Germany).
HUMAN ENGINEERING ASPECTS OF AUTOMATION AND RELIABILITY IN AIRCRAFT DESIGN [ANTHROPOTECHNISCHE ASPEKTE DER AUTOMATISIERUNG UND ZUVERLAESSIGKEIT IM LUFTFAHRZEUGBAU]
H. Von Diringshofen [1966] 9 p In GERMAN; ENGLISH summary Presented at the Ann. Joint Meeting DGRR/WGLR, Bad Godesberg, W. Germany, Oct. 1966
(EWR-111-66) CFSTI: $3.00

Future military high performance aircraft will require largely automatic aircraft controls to facilitate the pilot's task. The ensuing technical complexity will have to be compensated by improved electronic techniques, by redundancy, by automatic and semiautomatic checkout, and by the use of monitors. Under certain circumstances, automation may render an intervention on the part of the pilot, in case of serious technical disturbances, more difficult. This problem has to be solved by improved displays so that increased technical performance will not result in decreased reliability due to overburdening of the pilot. Author (ESRO)

N67-25686# Deutsche Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Institut fuer Flugmedizin.
ON THE COMPATIBILITY OF ARTIFICIAL GAS MIXTURES UNDER HIGH AND LOW PRESSURE [UEBER DIE VERTRAEGLICHKEIT KUENSTLICHER GASGENISCHE IM UEBER- UND UNTERDRUCK]
H. Hartmann [1966] 26 p In GERMAN; ENGLISH summary Presented at the Ann. Joint Meeting DGRR/WGLR, Bad Godesberg, W. Germany, Oct. 1966
(DGRR/WGLR Paper-66-090) CFSTI: HC $3.00/MF $0.65

The compatibility of artificial gas mixtures is dependent on the carbon dioxide and oxygen partial pressure of the inert gases. While the CO_2 partial pressure should not exceed 0.005 kg/cm^2, the level of the O partial pressure is dependent on the time of exposure. Thereby it is of no consequence whether the O partial pressures are reached by breathing of compressed air or by breathing of pure O. The O partial pressure must be maintained constantly on 0.2–0.3 kg/cm^2. For the inert gases it is possible that up to 8 kg/cm^2 N, up to 31 kg/cm^2 He, and then H is to be used. In pressure chamber experiments the pressure ranges from 4 to 8 kg/cm^2, with a time of exposure of 50 hours, were tested using an N–O mixture; and the ranges of 11, 16, 19, and 23 kg/cm^2 with a time of exposure of 100 hours using a He–N–O mixture. Reactions of incompatiblity of artificial gases can better be cleared by relatively short experiments under high pressure than by long-lasting exposure under low pressure. Investigations within the high and low pressure range can complement each other in many fields. Author (ESRO)

N67-25687 Entwicklungsring Sud, Munich (West Germany).
THE EFFICIENCY OF HUMAN BEHAVIOR DURING PILOTING AND TRACKING TASKS [DAS LEISTUNGSVERHALTEN DES MENSCHEN IN FLUGFUEHRUNGS- UND BEWEGUNGSFOLGEAUFGABEN]

Ruediger Seifert 31 Aug. 1966 12 p refs In GERMAN; ENGLISH summary Presented at the Ann. Joint Meeting DGRR/WGLR, Bad Godesberg, W. Germany, Oct. 1966
(EWR-116-66) CFSTI: $3.00

Time legs for perception, simple reaction time, and attention shift are discussed. Due to these limits, man is only to a rather limited extent able to perform tracking tasks. Therefore a system can only be controlled by man if its control characteristics are reduced, by technical controllers and other devices, and are adapted to the abilities of man. Controllability is also influenced by the display characteristics. For tracking tasks the head-up display seems to be most efficient. Author (ESRO)

N67-25742* Medical Coll. of Virginia, Richmond.
MECHANISMS OF CONTROL OF CEREBRAL CIRCULATION Status Report, 1 Apr.–30 Sep. 1966
30 Sep. 1966 5 p refs
(Grant NsG-156)
(NASA-CR-83831) CSCL 06P

Progress is reported in the following areas in a brain circulation study: (1) human cerebrovasodilator effects of pure hypoxia, (2) human cerebrovascular response to induced hypercapnia and eucapnic metabolic alkalosis, (3) continuous measurement of the cerebral blood flow in rhesus monkeys, (4) mechanism and pattern of human cerebrovascular regulation after rapid changes in blood CO_2 tension, and (5) effects of hypercapnia on human forearm blood vessels. C.T.C.

N67-25743* Naval School of Aviation Medicine, Pensacola, Fla.
THE PROBLEM OF MAN'S GRAVITOINERTIAL FORCE ENVIRONMENT IN SPACE FLIGHT Progress Report, 1 Jan.–31 Mar. 1967
Ashton Graybiel 31 Mar. 1967 5 p refs
(NASA Order R-93)
(NASA-CR-83832; PR-16) CSCL 06S

A review is presented of a conference on NASA missions-oriented research in the vestibular and related areas. An outline is given of a systems engineering approach regarding the vestibular problems which may be encountered in manned space flight, and a number of discrete categories of effort are discussed. Two approaches which NASA might take in studying problems of disorientation under space conditions are reported, and brief sessions devoted to such areas as circulation of the endolymph and blood supply to the labyrinthine organs are considered. C.T.C.

N67-25744* Public Health Service, Phoenix, Ariz. Planetary Quarantine Unit.
SERVICES PROVIDED IN SUPPORT OF THE PLANETARY QUARANTINE REQUIREMENTS OF THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, JANUARY–MARCH, 1967
M. S. Favero Apr. 1967 18 p ref
(NASA Order R-137)
(NASA-CR-83833; Rept.-17) CSCL 06M

Studies on the enumeration of microbial contaminants on surfaces were conducted, and tests were performed to determine the effect of temperature of the rinse fluid on recovery of naturally occurring microbial contaminants and spores of *Bacillus subtillis* var. *niger* from stainless steel surfaces by ultrasonication. Studies on the recovery of sublethally-injured microorganisms were continued, and studies were initiated to compare the efficiency of solid and liquid culture media for recovery of anaerobic spores. The comparative rates of dry heat inactivation for spores of mesophilic, psychrophilic, and thermophilic bacteria were determined, with tests conducted at 125°C in a silicone oil bath. Tables are included which cover such areas as the effects of varying the temperatures of peptone water and ultrasonic tank solution on recovery of spores of *Bacillus subtilis* var. *niger* from stainless steel strips, comparison of different inoculation methods on recovery of spores, and the level of microbial contamination on the surface of three lunar orbiters. C.T.C.

N67-25753*# Martin Co., Baltimore, Md. Research Inst. for Advanced Studies.
RESEARCH IN PHOTOSYNTHESIS Quarterly Report, 6 Mar.–6 Jun. 1966
Bessel Kok 6 Jun. 1966 40 p refs
(Contract NASw-747)
(NASA-CR-83842; QR-12) CFSTI: HC $3.00/MF $0.65 CSCL 06C

A critical evaluation is made of the function of manganese in photosynthesis, and includes an examination of the manner in which manganese is bound within the chloroplast. The areas covered include difference spectroscopy, quantum yields in chloroplast reactions as a function of wavelength, and analysis of the oxygen evolving photoreaction by means of fluorescence. C.T.C.

N67-25760*# State Univ. of New York at Buffalo. Center for Theoretical Biology.
MULTIDISCIPLINARY RESEARCH IN THEORETICAL BIOLOGY Progress Report, 1966
J. F. Danielli [1967] 74 p refs
(Grant NGR-33-015-016)
(NASA-CR-83805) CFSTI: HC $3.00/MF $0.65 CSCL 06C

A compilation of progress reports of multidisciplinary research in theoretical biology are presented. Reported are such areas as the design of low molecular weight compounds having enzymic properties; the application of Liapunov methods and homogeneous polynomial transformations to problems in ecology and population genetics; studies of the properties of monolayers of synthetic compounds of biological significance; the structure of lipid membranes; cell control phenomena in *Amoeba*; theory of cells; pharmocology research; and studies on the physical basis of cytoplasmic inheritance and cellular regulation. Included under each area are lists of the research projects undertaken, meetings attended, and publications eminating from the studies. C.T.C.

N67-25805*# Holman (John F.) and Co., Inc., Washington, D. C.
EXPERIMENTAL PARTHENOGENETIC SEGMENTATION IN AMPHIBIANS AND FISHES [LA SEGMENTATION PARTHENOGENETIQUE EXPERIMENTALE CHEZ LES AMPHIBIENS ET LES POISSONS]
E. Bataillon Mar. 1967 4 p refs Transl. into ENGLISH from Compt. Rend. (Paris), v. 131, 1900 p 115–118
(Contract NASw-1495)
(NASA-TT-F-10798) CFSTI: HC $3.00/MF $0.65

Experimental parthenogenetic segmentation has been induced by a wide variety of agents. The hypothesis is advanced that this effect is attributable to the osmotic pressure of the agents used. The osmotic pressure of the medium causes a relative dehydration which favors nuclear division and permits the cell to prepare the centers of the first cell divisions which appear on contact with the normal media at low osmotic pressure. Author

N67-25816*# National Aeronautics and Space Administration, Washington, D. C.
GASTRIC AND DUODENAL CHANGES PRODUCED IN SALINE SOLUTIONS AS A FUNCTION OF THEIR MOLECULAR CONCENTRATION; THE REGULATORY REFLEX Δ OF THE PYLORIC SPHINCTER [MODIFICATIONS SUBIES, DANS L'ESTOMAC ET LE DUODENUM, PAR LES SOLUTIONS SALINES, SUIVANT LEUR CONCENTRATION MOLECULAIRE. LE REFLEXE Δ—REGULATEUR DU SPHINCTER PYLORIQUE]

P. Carnot and A. Chassevant May 1967 4 p Transl. into ENGLISH from Compt. Rend. Soc. Biol. (Paris), v. 58, 1905 p 173–176
(NASA-TT-F-10926) CFSTI: HC $3.00/MF $0.65 CSCL 06C

Studies on the changes suffered in stomach and duodenum by isotonic, hypotonic, and hypertonic NaCl solutions in dependence on their molecular concentration, as well as the functioning of the pyloric sphincter in the presence of such solutions, are discussed. Experiments with aspiration of gastric juice and removal of duodenal juice through a fistula showed that isotonic solutions pass rapidly through the pylorus without undergoing major changes; hypotonic solutions are evacuated less rapidly and show greater changes the farther they are from isotony; hypertonic solutions produce excessive delay of gastric evacuation in proportion with the concentration. Apparently, the more strongly hypertonic the absorbed solution, the more will its pyloric evacuation be retarded. Various values for the regulatory reflex Δ of the pyloric sphincter are determined and listed. Author

N67-25838*# Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
EFFECT OF WATER PROPERTIES IN THIXOTROPIC CLAY SYSTEMS ON BIOLOGICAL ACTIVITY Annual Report
Philip F. Low 1966 48 p refs
(Grant NGR-15-007-004)
(NASA-CR-83852) CFSTI: HC $3.00/MF $0.65 CSCL 02D

In this report data are presented to show that suspensions of Na-clay in water are Newtonian and non-hysteretic in their shear stress–shear rate behavior below a clay content of 4 percent by weight but are non-Newtonian and hysteretic above this clay content; also, at this clay content there is a sudden increase in viscosity. Suspensions of Na/Al-clay in water are shown to be more viscous than those of Na-clay, to exhibit no sudden changes in viscosity and to be more non-Newtonian and hysteretic in their behavior. These data are interpreted, with the help of absolute-reaction rate theory, in terms of the existence of strong and weak bonds in the systems. Data on the specific heat capacities of Na-clay and Na/Al-clay suspensions, obtained with a sensitive microcalorimeter, show that capacity departures are due to interaction between particle surfaces and the associated water, which results in a lattice-ordered water structure of appreciable integrity and extent. Author

N67-25847*# National Aeronautics and Space Administration, Washington, D. C.
MEDICO-PHYSIOLOGICAL INCIDENCES ON THE PILOT FOR FLIGHT PATTERNS TYPICAL OF VTOL [INCIDENCES MEDICO-PHYSIOLOGIQUES SUR LE PILOTE DES CONFIGURATIONS DE VOL PROPRES AU VTOL]
R. Auffret and H. Seris May 1967 15 p Transl. into ENGLISH from French Presented at 22d Meeting of AGARD Aerospace Med. Panel, Sep. 1965
(NASA-TT-F-470) CFSTI: HC $3.00/MF $0.65 CSCL 05H

The mechanical complexity of VTOL operation is assessed, and it is pointed out that the procedures developed for low speed flight pose new problems for the pilot. These are in addition to such difficulties as the altitude and speed encountered in normal high performance aircraft, and the various phases of takeoff, transition, and landing on a pinpoint location. With specific reference to medico-physiological demands on the pilot it is indicated that in the VTOL there is little danger of contamination of the cabin from exhaust gases, and that most missions can be flown without oxygen mask, but that such apparatus must be available for high altitudes and for certain special requirements. Low frequency vibrations are not regarded as a potential hazard since their occurrence in the tested VTOLs was brief. It is recommended that emergency ejection be effected through the windshield at low altitudes: statistics are quoted which indicate that damage from the shattered glass is not a major factor. Author

N67-25870*# Stanford Univ., Calif. Instrumentation Research Lab.
CYTOCHEMICAL STUDIES OF PLANETARY MICROORGANISMS—EXPLORATIONS IN EXOBIOLOGY Status Report, Apr. 1–Oct. 1, 1966
Joshua Lederberg 1 Oct. 1966 47 p refs
(Grant NsG-81-60; NSF NB-04270; NIH FR-00311-01; NIH CA-04681-08; Contract AF 49(638)-1599)
(NASA-CR-83898) CFSTI: HC $3.00/MF $0.65 CSCL 06M

The general project areas of fluorometry, gas chromatography and optical resolution, mass spectrometry, computer managed instrumentation, and ultraviolet microspectrometry are discussed in a program of cytochemical studies of planetary microorganisms. In a previous report it was shown that amino acid β-naphthylamides (BNA) could be used as fluorogenic substrates in a very sensitive assay for aminopeptidase activity in soil. This work was extended to an investigation of the relative specificity of a number of pure strains of bacteria towards the eighteen different amino acid BNAs. A summary of a computer system to aid in medical research experiments is included. C.T.C.

N67-25874* Georgia Univ., Athens. Inst. of Ecology.
BIODYNAMICS OF MICROECOSYSTEMS Final Report, Jul. 23, 1964–Jul. 23, 1966
E. P. Odum and R. J. Beyers 23 Jul. 1966 46 p refs
(Grant NsG-706)
(NASA-CR-83884) CFSTI: HC $3.00 CSCL 06M

Accomplishments are reported in a program to test the hypothesis that true stability in a life support system is obtainable only after the system becomes adjusted to its boundary conditions (i.e., outside environment and internal chemical and aspects composition) by the process of ecological succession. Studies on succession in sub-cultures derived from microecosystems that have maintained themselves in a stable state for several years have revealed important differences between heterotrophic and autotrophic succession. Furthermore, use of gamma irradiation as a stress factor has revealed sensitivity of the bacterial stage that is a prerequisite to the algal bloom stage of heterotrophic succession. Experiments were conducted on the effects of photo period and medium composition on succession in the microcosms. In terms of theory and regenerative systems, it was demonstrated that "efficiency" in terms of ratio of primary productivity to biomass or weight always decreases until stability is achieved, while the reciprocal "efficiency" increases and is maximum as steady state is achieved. C.T.C.

N67-25877* Wilmot Castle Co., Rochester, N.Y.
DEVELOPMENT OF A BIOLOGICAL INDICATOR FOR DRY HEAT STERILIZATION Final Summary Report
Norman S. Davis 10 Jan. 1967 86 p Prepared for JPL
(Contract NAS7-100)
(NASA-CR-83887) CFSTI: HC $3.00/MF $0.65 CSCL 06M

A biological sterility indicator was designed for dry heat sterilization at 135°C. Tablets composed of cleaned, well-dried spores of *Bacillus subtilis* WC18, a notably heat resistant organism, were hermetically sealed under dry nitrogen in a Teflon container. The container was surrounded by various metalized thermostable films and sealed in Aclar film. Each tablet contained about 1×10^{10} spores. Thermal studies were conducted for exposures of 2 to 24 hours at 135°C. Only one-third of the indicators survived the constraint of survival for 18 hours at 135°C. It was found that dispersion and agitation significantly increased the incidence of positive cultures in trypticase soy broth, but a 100 percent reliable indicator was not achieved. The environmental and nutritional requirements for recovering thermally injured spores of the test organism must be established. Author

N67-25889*# Indiana Univ., Bloomington. Dept. of Anatomy and Physiology.

PART III: THE EFFECTS OF THERMAL STRESSES ON THE AEROBIC AND ANAEROBIC WORK CAPACITIES OF MEN Final Scientific Report

S. Robinson, B. Sadowski, and J. L. Newton 31 Dec. 1966 21 p refs

(Grant NsG-408)

(NASA-CR-83929) CFSTI: HC $3.00/MF $0.65 CSCL 06S

The effects of hyperthermia and hypothermia on $\dot{V}_{O_2}$ max, O_2 debt, and the elevation of blood lactate of 4 men in exhausting work were determined. After appropriate preconditioning periods in control (24°C), hot and cold environments, each man ran on the treadmill at a rate selected to exhaust him in 3 to 6 minutes. The reduced capacity for running in the heat was dependent on average reductions of 5% in $\dot{V}_{O_2}$ max and 10% in O_2 debt, the latter associated with a reduction of 15% in blood lactate, as compared with values observed in the control runs. These changes in the heat were due to circulatory strain resulting from conflicting demands for circulation to the working muscles and for cutaneous circulation in heat transport. The O_2 requirement in the heat was unchanged from controls. The reduced capacity for running in the cold was dependent on average reductions of 5% in $\dot{V}_{O_2}$ max and an increase of 6% in the O_2 requirement with no significant difference in average values of O_2 debt and lactate from values in control runs. The decreased efficiency in the cold probably resulted from increased tension and viscosity in the cold muscles, and the fact that more of the energy involved in the work was derived from anaerobic sources than in the control runs. Author

N67-25951*# Maryland Univ., College Park. Dept. of Psychology.

RESPONSE SUPPRESSION AS A FUNCTION OF A VACATION FROM PUNISHMENT

David Orme-Johnson [1967] 10 p refs

(Grant NsG-189-61)

(NASA-CR-83909; TR-67-10) CFSTI: HC $3.00/MF $0.65 CSCL 05J

When subjects are removed from a punishing situation for some time and then reintroduced into the same situation, the punishment effect is often increased. The present experiment showed that after a two day vacation the rate of responding of pigeons during punishment was much lower than it was before the vacation. However, with successive vacations, this effect on punishment diminished. Author

N67-25968*# Naval School of Aviation Medicine, Pensacola, Fla.

A HEAD RESTRAINT DEVICE FOR VESTIBULAR STUDIES

W. Carroll, Jorma I. Niven, and Charles A. Lowery Jan. 1967 10 p refs

(NASA Order R-93)

(NASA-CR-83949; NAMI-992) CFSTI: HC $3.00/MF $0.65 CSCL 06B

A restraint system based on a vacuum bladder technique was constructed from standard, commercially available materials. It provides a degree of restraint comparable to that available with permanent, rigid head/torso molds individually fitted to each subject without the attendant costs in preparation time and money. Author

N67-25971# Naval Radiological Defense Lab., San Francisco, Calif.

APPLICATION OF PREMACK'S THEORY TO A CLASSICALLY CONDITIONED SUCROSE AVERSION INDUCED BY X-RAY EXPOSURE

Robert W. Schaeffer, Edward L. Hunt, and Donald J. Kimeldorf 22 Dec. 1966 24 p refs

(USNRDL-TR-67-2; AD-647647) CFSTI: HC $3.00/MF $0.65

Five groups of six rats per group were tested daily for 60 days on two-bottle 30-min. preference test in which one bottle contained water and the second bottle contained either water or a 4, 8, 16, or 32% sucrose solution. A classically conditioned aversion was induced by pairing the taste of sucrose with an exposure to 100 R of X-rays (5 R/min.) on 3 successive occasions. The rate of sucrose drinking prior to, and following each irradiation, as well as the degree of the conditioned aversion, varied directly with the concentration of the sucrose solution. This was interpreted as evidence for the applicability to classical conditioning of Premack's reinforcement theory in which the rate of reinforced responding is determined in part by the precontingency rate of the response. Author (TAB)

N67-25978*# Miami Valley Hospital, Dayton, Ohio. Research Dept.

NUTRITIONAL EVALUATION OF A PRECOOKED DEHYDRATED AND BITE-SIZED COMPRESSED FOOD DIET AS SOLE SOURCE OF NUTRIMENT FOR SIX WEEKS Final Report, Aug. 1963–Jun. 1966

Keith J. Smith Wright-Patterson AFB, Ohio, AMRL, Jul. 1966 39 p refs Prepared jointly with Aerospace Med. Res. Lab. Supported in part by NASA

(Contract AF 33(657)-11716)

(NASA-CR-84009; AMRL-TR-66-3; AD-646642) CFSTI: HC $3.00/MF $0.65 CSCL 06H

A series of experiments has been designed to determine the water, energy, and protein requirements of man under various simulated aerospace conditions. The 42-day experiment reported herein was designed to evaluate nutritionally an experimental diet composed of precooked dehydrated and bite-sized compressed foods. Organoleptically, the experimental diet was highly acceptable. The food items did not become less acceptable after having been served repeatedly or a long period of time. The nutritional balance data show that the experimental diet was highly utilized and that it efficiently maintained the subjects for the duration of the experiment. The confinement of the subjects for 28 days in the Aerospace Medical Research Laboratories Life Support Systems Evaluator did not affect subject body weight, nutrient balance, digestion, or water balance. No abnormal hematological or physiological measurements were recorded as a result of subsisting on the experimental diet. Author (TAB)

N67-26018*# Massachusetts Inst. of Tech., Cambridge. Engineering Projects Lab.

MEASUREMENT AND DISPLAY OF CONTROL INFORMATION (REMOTE MANIPULATION AND MANUAL CONTROL) Progress Report, 1 Apr.–30 Sep. 1966

Thomas B. Sheridan and William R. Ferrell 30 Sep. 1966 25 p refs

(Grant NsG-107-61)

(NASA-CR-83980; DSR-79991-6) CFSTI: HC $3.00/MF $0.65 CSCL 05H

Studies focusing on the measurement and display of control information using remote manipulation and manual control techniques are reported. Summarized are continued research in the following areas: supervisory control; formal description and theory; touch sensors; time-optimal control of a second order system by a human operator; dynamic programming in self-paced systems; preview control model experiments; and experiments with human subjects in optimal control of previewed inputs. S.C.W.

N67-26036 Institute for Perception RVO–TNO, Soesterberg (Netherlands).

NOISE REDUCTION CAPACITY OF NOISE PROTECTORS MANUFACTURED BY SAFETY SUPPLY CO. [GELUIDVERZWAKKING VAN DE GEHOORBESCHERMER SAFETY SUPPLY CO.]

L. C. W. Pols Dec. 1966 6 p In DUTCH
(A66/KLU/080; IZF-1966-20; TDCK-47678) CFSTI: HC $3.00

The noise reduction capacity of randomly selected ear protectors was determined by measuring the audio threshold of both ears simultaneously as a function of frequency in tests involving several persons with and without the protectors in place. The difference, expressed in decibels and representing the reduction capacity, is tabulated for noise frequencies ranging from 125 Hz to 8000 Hz. Transl. by K.W.

N67-26066*# Hamilton Standard Div., United Aircraft Corp., Broad Brook, Conn.
HUMAN ENGINEERING DESIGN CRITERIA HANDBOOK FOR LUNAR SCIENTIFIC EQUIPMENT
K. C. Jones 15 Jan. 1967 22 p Revision I
(Contract NAS8-20095)
(NASA-CR-83963; SVHSER-3998) CFSTI: HC $3.00/MF $0.65 CSCL 05E

The human factor portion of an experimental investigation of specific lunar mission scientific equipment mockups is summarized. The constraints which must be placed on equipment designs due to inherent human limitations are delineated, and a preliminary attempt is made to establish a human engineering design criteria baseline for pressure-suited man-mission, man-equipment interfaces. The human limitations considered include range of mobility, applied force and the resulting torques, and the further psychophysiological and mobility restrictions of an Apollo type of space suit working environment. C.T.C.

N67-26073* Harvard School of Public Health, Boston, Mass.
STUDY OF SPACE CABIN ATMOSPHERES Status Report, Jul. 1–Dec. 31, 1966
William A. Burgess and Parker C. Reist 31 Mar. 1967 9 p
(Grant NGR-22-007-053)
(NASA-CR-83915) CFSTI: $3.00 CSCL 06K

Principal activities were on the generation of aerosols for instrument calibration, the calibration of several aerosol particle analyzers, the design of a computer program for analyzing collected data, and the evaluation of various sensing methods for monitoring large particles in a spacecraft. Author

N67-26074*# Case Inst. of Tech., Cleveland, Ohio. Solid State Electronics Lab.
INVESTIGATION OF IMPLANTABLE MULTICHANNEL BIOTELEMETRY SYSTEMS Semiannual Report, Sep. 1966–Mar. 1967
W. H. Ko, E. Yon, and W. Thompson Apr. 1967 26 p refs
(Grant NGR-36-003-079)
(NASA-CR-83914; SAR-2) CFSTI: HC $3.00/MF $0.65 CSCL 06B

The purpose of this project is to develop techniques for fabrication of multiple-channel, physiologically implantable, telemetry systems. These systems must be able to telemeter a wide range of physiological signals. A system design has been formulated and tested. The system uses a PAM-FM, time-division multiplexed format and is sufficiently flexible to allow the use of any number of channels up to ten with a total information bandwidth of up to 20 KHz. Tests have been made on a prototype system having one channel, two 3 KHz channels for electrical signals, and one strain gage channel with a 200 Hz bandwidth. The noise levels for the 3 KHz were under 2% of full scale; for the strain gage channel, the noise level was under 1% of full scale. An implant test was made in a dog of a transmitter using the same RF circuitry as the final unit. The transmitter had one subcarrier oscillator whose frequency was controlled by a strain gage. Standard miniature components were used throughout. The unit, which was powered by mercury batteries with a predicted lifetime of 150 hours of operation, was activated by a magnetic switch from outside the animal. Author

N67-26081# Istituto Superiore di Sanita, Rome (Italy). Laboratori di Fisica.
TECHNOLOGICAL STUDIES OF THE MECHANICAL RESISTANCE OF THE MONTIVEL FILM (POLYESTER) EXPOSED TO γ-RADIATION [RICHERCHE TECNOLOGI CHE SULLA RESISTENZA MECCANICA DEL FILM MONTIVEL (POLIESTERE) ESPOSTO A RADIAZIONI γ]
R. Crateri 4 Oct. 1966 14 p In ITALIAN; ENGLISH summary
(ISS-66/34) CFSTI: HC $3.00/MF $0.65

Some results of the mechanical resistance measurements of the "Montivel" film, new fresh or exposed to γ-rays, are shown. A Montivel safety-phlange to be used near radiation sources is described, together with the results of some tests of this device. Author

N67-26095 Istituto Superiore di Sanita, Rome (Italy). Laboratori di Fisica.
THE SEMINAR AT THE PHYSICS LABORATORY DURING THE PERIOD MAY–AUGUST 1966 [IL SEMINARIO DEI LABORATORI DI FISICA NEL QUADRIMESTRE MAGGIO–AGOSTO 1966]
9 Sep. 1966 54 p refs In ITALIAN and ENGLISH
(ISS-66/29) CFSTI: $3.00

Briefly outlined are some topics discussed at a Seminar in the Physics Laboratory of the Instituto Superiore di Sanita during May–August 1966. Some concepts considered were: potassium-argon method for measuring geological time; radioactive contamination of populations; nucleic acid structure; the nature of crossing-over in *Aspergillus nidulans;* Quasi-elastic scattering reactions on the interaction in the final state; ferritin-labeled antibody, a strategic tool in electron microscopic investigations of antigens, antibodies and antigen-antibody reaction; fidelity in the translation of the genetic code; and amber suppression and the ribosomes. Transl. by R.LI.

N67-26108 Max-Planck-Institut fur Biophysik, Frankfurt am Main (West Germany).
THE NATURAL CAPACITY OF THE HUMAN BODY TO ALPHA RAY NUCLIDES [DER NATUERLICHE GEHALT DES MENSCHLICHEN KOERPERS AN ALPHASTRAHLENED NUKLIDEN]
Willi Strahlhofen (Ph.D. Thesis—Frankfurt am. Main Univ.) 1964 155 p refs In GERMAN
CFSTI: $3.00

The purpose of the present work was to determine content and distribution of the natural alpha-radiating nuclides Ra 226, Th 228, and Po 210 in the human body. Samples of human bones and soft tissues were examined by the emanation method for Ra 226 content; the Po 210 content was determined subsequent to chemical enrichment by means of a methane flow counter; and a special scintillation method was used to determine the Th 228 content. A control of the individually obtained values was obtained by measuring the total alpha activity simultaneously with the scintillation method. The Po 210 and Pb 210 content in femur and tibia samples was measured, and the ratio of activity of Po 210 to Pb 210 in the skeleton of the living human organism was determined. The activity values obtained for Ra 226, Th 228, and Po 210 permit to make new estimates of the natural radiation •hat affects humans. Transl. by K.W.

N67-26147 Flying Personnel Research Committee, London (England).
COMPLEX REACTION TIMES AT A SIMULATED CABIN ALTITUDE OF 8,000 FEET
D. M. Denison and F. Ledwith (RAF Inst. of Aviation Med.) Apr. 1965 19 p refs
(FPRC/1235) CFSTI: HC $3.00

Eight subjects were tested on a task involving spatial transformations of information presented to them. Performance was

compared under conditions equivalent to breathing air at ground level and at an altitude of 8,000 feet. Reaction times were significantly slower at the 8,000 ft altitude during the early learning of the skill. Author

N67-26157 Institute for Perception RVO-TNO, Soesterberg (Netherlands).
ONDERZOEK "SPEECHMEMBRANE DOORMAN" [ONDERZOEK "SPRAAKMEMBRAAN DOORMAN"]
L. C. W. Pols Jul. 1966 9 p refs In DUTCH; ENGLISH summary
(A65/KM/081; IZF-1966-18; TDCK-47146) CFSTI: $3.00

The influence of the application of the Doorman speech membrane on the Dutch gas mask K as far as the speech intelligibility is concerned has been examined. The sound attenuation of the gas mask, with and without the membrane, has been measured as a function of the frequency. The overall speech attenuation value was determined from the attenuation curves. This is a measure for the intelligibility. Application of the Doorman membrane on the gas mask K improved somewhat the intelligibility, which is now comparable with that of the English mask. Moreover the maximal obtainable speech intelligibility when using the principle of this membrane has been determined. Author

N67-26158 Chemical Lab. RVO-TNO, Rijswijk (Netherlands).
THE SANDFILTER: A CRITICAL SURVEY OF THE LITERATURE
M. van Zelm and L. A. Clarenburg Nov. 1966 41 p refs
(TDCK-47088; Rept.-1966-18) CFSTI: $3.00

A survey is given of the literature relevant to the application of sandfilters in collective protection. The following properties normally attributed to the sandfilter are examined: (a) heat capacity, (b) attenuating effect on shock waves, (c) moisture capacity, (d) protection capacity for toxic vapors, and (e) protection capacity for aerosol- and fallout particles. It is concluded that the sandfilter has some favorable properties; its attenuating effect for shock waves, its temperature and moisture levelling effect and hence a controlling effect on the climate in a shelter, and its ability to retain hydrolysable gases and large aerosol particles (fallout). As a main filter the sand filter protects satisfactorily against the effects of nuclear explosions, however insufficient protection is offered against chemical agents. As a prefilter it has to be used in conjunction with an anti-blast device to protect the aerosol filter. Author

N67-26212# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
A FEW EXPERIMENTS ON THE SPECTRAL TRANSMISSION OF THE EYELID
J. J. Vos and J. Boogaard [1966] 6 p refs
(IZF-1966-15; TDCK-46915) CFSTI: HC $3.00/MF $0.65

A few data are given on the spectral transmission of the eyelid. These data may be of relevance for the protection against ocular hazard, by nuclear flashes or laser radiation. Author

N67-26221# San Francisco Univ., Calif. Inst. of Chemical Biology.
EFFECT OF HYDRAZINES ON VITAMIN B6 LEVELS IN THE MOUSE BRAIN Final Report, Mar. 1965–Feb. 1966
Arthur Furst and Waldemar R. Gustavson Wright-Patterson AFB, Ohio, AMRL, Sep. 1966 46 p refs
(Contract AF 33(615)-2332)
(AF-IF; AMRL-TR-66-135; AD-647192) CFSTI: HC $3.00/MF $0.65

The effects of administered 1,1-dimethylhydrazine (UDMH) and monomethylhydrazine (MMH) on vitamin B6 levels in mouse brain have been studied. Separation of the B6 group (pyridoxol, pyridoxal, pyridoxamine, and the respective 5-phosphates) by means of paper chromatography revealed that the R sub F values obtained are dependent upon the pH of the developing solvent. To obtain the time lag just prior to convulsions induced by UDMH and MMH, a dose-lag time study was conducted; included were pyridoxal and (its 5-phosphate) hydrazones of UDMH and MMH. Graphs of log dose vs lag time are given. The bioassay procedure, though not completed, permits detection of some of the B6 congeners to a limit of 0.5 nanograms. Author (TAB)

N67-26227# Arizona State Univ., Tempe.
THE EFFECT OF INTRINSIC AND EXTRINSIC REINFORCEMENT CONTINGENCIES ON LEARNER PERFORMANCE Final Report, Feb. 1964–Feb. 1966
Howard J. Sullivan, Robert L. Baker, and Richard E. Schutz Wright-Patterson AFB, Ohio, AMRL, Sep. 1966 14 p refs
(Contract AF 33(615)-1507)
(AMRL-TR-66-138; AD-647273) CFSTI: HC $3.00/MF $0.65

Seventy-six AFROTC Cadets studied a revised version of the text, The Military Justice System, for four 50-minute class periods distributed over 2 weeks. Unit-mastery tests of about 12 multiple-choice items each were administered at 11 points throughout the text. Half of the subjects (Cadets) received no knowledge of the correctness of their responses on the unit-mastery test. The other half of the subjects used chemically treated answer sheets which immediately indicated whether or not the subjects answer was correct. A 100-item multiple-choice test over the text was administered to all subjects 2 days after the final instruction period. All subjects had been informed of the final test. Half of the subjects in each of the above groups had been assured payment of $2.50 for participation in the study. Each student in the other half had been told that he would receive $4.00 if he scored 80% or higher on the final test, $2.00 if he scored from 50 to 79% and nothing if he scored below 50%. Compared with other subjects, subjects using the chemically treated answer sheets completed the study of the text in less time and appeared to depend on the mastery test for additional instruction. They performed significantly poorer on the Unit-Mastery tests. On the final criterion test, however, none of the groups differed significantly. Rather complex factors must be considered in specifying the optimal conditions of reinforcement and incentives. Author (TAB)

N67-26232# Naval Personnel Research Activity, San Diego, Calif.
A COMPARISON OF PROMPTING VERSUS FEEDBACK IN VERBAL AND PERCEPTUAL LEARNING
Alan W. Lau Oct. 1966 26 p refs
(STB-67-8; AD-647459) CFSTI: HC $3.00/MF $0.65

The report reviews the literature on two general approaches to training--feedback and prompting. These techniques are examined in four interrelated areas: (1) Verbal learning, (2) categorical perceptual identifications, (3) comparative perceptual judgments, and (4) monitoring. Following this review, suggestions for further research are made. In general, the review shows prompting to be as effective as, and sometimes more effective than, feedback in improving performance on both verbal and perceptual learning tasks, with substantially shorter time investments. The position that a response-contingent procedure is the most effective training procedure does not, at least in some kinds of learning, appear to be tenable. Apparently, the advantage of prompting over feedback lies in the achievement of greater temporal contiguity between the stimulus and its identification and also, to some degree, in the avoidance of requiring students to make incorrect overt responses. In some learning situations, prompting has the additional advantages of directing attention more effectively toward relevant stimulus characteristics and providing more information about these characteristics. Author (TAB)

N67-26233# Stanford Univ., Calif.
COMPARISON OF ROLE DIFFERENTIATION IN SEVERAL SITUATIONS
David P. Gustafson Dec. 1966 29 p refs
(Contract Nonr-225(62))
(TR-15; AD-646768) CFSTI: HC $3.00/MF $0.65

Twenty-four five man groups of MBA students discussed human relations cases in four half-hour sessions. There were 12 groups from the Stanford MBA class of 1966 and 12 from the class of 1967. An observer recorded the amount of time each student talked. Students ranked each other on Best Ideas, Guidance, Leader and Being Liked. Less role differentiation was found in both of these studies as compared with a study performed by Bales and Slater. Comparisons between these two studies at Stanford showed that one class tended to have less role differentiation by the fourth session. Differences in experimental conditions were discussed that could have reduced the subjects commitment and interest in the task in the class that had greater role differentiation. The study confirmed Bales and Slaters finding that role differentiation was less in groups with high status-consensus. Author (TAB)

N67-26246*# American Inst. of Biological Sciences, Washington, D. C. Bioinstrumentation Advisory Council.
BIOINSTRUMENTATION ACTIVITIES IN FOUR LOCALES
Lloyd E. Slater 15 Jun. 1966 17 p
(Grants NASr-132; Nonr-4526(04))
(NASA-CR-84238; AD-647284) CFSTI: HC $3.00/MF $0.65 CSCL 06B

Progress in bio-instrumentation was observed in the laboratories where instruments are both developed and used in tackling the research and applications problems of biology. The report concerns visits to four locations, and provides hints on how successful bioinstrumentation can be carried out in exceedingly different environments. Author (TAB)

N67-26248# Naval Personnel Research Activity, San Diego, Calif.
ITEM RESPONSE CHARACTERISTICS IN ATTITUDE AND PERSONALITY MEASUREMENT: A REACTION TO L. G. ROPER'S "THE GREAT RESPONSE-STYLE MYTH"
Edward A. Rundquist Jan. 1967 16 p refs
(STB-67-16; AD-646772) CFSTI: HC $3.00/MF $0.65

However defined, response style is not a myth. Responses to personality items are the result of, among other things, (a) item content (b) social desirability of this content, (c) form in which this content is stated, proportion of each form of statement in an inventory, (d) the desire to dissimulate with respect to the content, and (e) response style. Responses to form of statement--reversed items--conform perfectly to 1 definition of response bias. The differences in correlational and other characteristics of sets of reversed items are a major cause for the confounding and confusion in the interpretation of studies of social desirability and acquiescence. The great need is for external validation studies in relation to the factors that influence personality item responses. TAB

N67-26270*# Naval School of Aviation Medicine, Pensacola, Fla.
THE EFFECT OF DRUGS IN ALTERING SUSCEPTIBILITY TO MOTION SICKNESS IN AEROBATICS AND THE SLOW ROTATION ROOM
Frederick R. Deane, Charles D. Wood, Ashton Graybiel, and Arthur C. Cawrse 3 Jun. 1966 14 p refs
(NASA Order R-93)
(NASA-CR-84019; NAMI-971) CFSTI: HC $3.00/MF $0.65 CSCL 06S

Seven exemplary antimotion sickness drugs and three individually treated placebos were investigated in ten men during 24 aerobatic maneuvers in an A1E Skyraider aircraft and in performance of slow rotation room dial test. The rank order of drug effectiveness and of subject susceptibility under each condition was determined and compared. Individual difference in drug effectiveness was significant at the .01 level or better and was similar under the two conditions. Susceptibility to motion sickness in the slow rotation room was generally a good predictor of susceptibility in aerobatics in eight subjects, but in the remaining two it was grossly in error. A combination of scopolamine and d-amphetamine was by far the most effective of the drugs tested under both conditions. Author

N67-26284* Maryland Univ., Baltimore.
MOLECULAR BINDING IN THE CELL SURFACE Progress Report
Robert G. Grenell and Duncan McCulloch 31 Mar. 1967 25 p refs
(Grant NGR-21-002-040)
(NASA-CR-84051) CFSTI: HC $3.00 CSCL 06C

The microwave absorption of various protein solution, water, and organic solvents was examined with a Tektronix # 1L-30 Spectrum Analyzer in an attempt to determine the feasibility of the application of a new instrument to bound-water studies of cell proteins. Differences were observed in the absorbed microwave power for varying concentrations of Bovine Serum Albumin dissolved in water and for these solutions with and without a dissolved barbiturate. Marked differences were observed between the absorption of water-based solutions, the absorption of gels, and the absorption of organic solvents. Results suggest the validity of the Analyzer application, but the detailed interpretation of spectra and a proper assessment of the limitations of the instrument will require additional experimentation and refinement in the microwave hardware. The existing instrument is described, and additional microwave equipment needed to improve its precision is discussed. Author

N67-26285*# Midwest Research Inst., Kansas City, Mo.
MEDICAL APPLICATIONS OF NASA-DEVELOPED SCIENCE AND TECHNOLOGY Quarterly Progress Report, 1 Jan.–31 Mar. 1967
David Bendersky 31 Mar. 1967 47 p
(Contract NASr-63(11); MRI Proj. 2961-E)
(NASA-CR-84050; QPR-4) CFSTI: HC $3.00/MF $0.65 CSCL 06C

Medical problems discussed include: 1) spray-on electrocardiographic electrodes, 2) respiration measuring equipment, 3) nasal packs, 4) a brain lesion device, 5) cardiac output measurement, 6) a muscle accelerometer, 7) sterile hospital room atmospheres, 8) speech spectra analysis, 9) temporomandibular joint action, and 10) liquid delivery to the respiratory tract. Other miscellaneous activities are reported. Several medical problem abstracts, and NASA Tech Briefs are presented, along with lists showing the work status of several medical problems. L.S.

N67-26298*# Department of the Army, Fort Detrick, Md.
STERILIZATION OF LIQUIDS BY FILTRATION AND CERTIFICATION OF PROBABILITY
Dorothy M. Portner, Charles F. Phillips, and Robert K. Hoffman Apr. 1967 18 p refs *Its* Tech. Manuscript-387
(NASA Order R-35)
(NASA-CR-84038) CFSTI: HC $3.00/MF $0.65 CSCL 06C

Four types of hydrosol filters, two reusable (diatomaceous cylinder and fritted glass funnel) and two disposable (asbestos pad and membrane filter), were challenged with a heavy *Serratia marcescens* suspension to assess their ability to produce sterile filtrates. Two of the four diatomaceous earth filters, the four fritted glass funnels, and all the asbestos pads tested generally gave sterile filtrates. However, only one type of filter, one of the membranes in its manufacturer's own holder, consistently gave sterile filtrates. The two other types of membranes usually gave sterile filtrates if tested in one manufacturer's holder but all types invariably

gave contaminated filtrates when tested in another manufacturer's holder. Contaminated filtrates were generally attributed to a poor reusable filter or to a faulty holder used with a disposable filter. If a high degree of certainty is required for sterile heat-labile filtrate, it is suggested that the liquid be passed through two or more filters in a previously tested and proved system. Author

N67-26335*# Union Carbide Research Inst., Tarrytown, N. Y.
THE GENERAL AND COMPARATIVE BIOLOGY OF TERRESTRIAL ORGANISMS UNDER EXPERIMENTAL STRESS CONDITIONS Final Report
S. M. Siegel 1 May 1967 76 p
(Contract NASw-767)
(NASA-CR-84032; UCRI-439) CFSTI: HC $3.00/MF $0.65 CSCL 06M

Emphasis is placed on altered liquid media, toxicants, and noble gas anoxia, with descriptive data given for the phenomenon of life processes in the most hypertonic aqueous liquid possible, saturated LiCl. Quantitative data in relation to KCl suppression of growth in *Penicillium notatum* is presented. The most novel subjects deal with the same *Penicillium* mutant grown with boron and heavy metals and other elements in the nutrient media. Evidence provided by tritium-label incorporation studies verifies at the biochemical level *Penicillium* spore germination in liquid NH_3 medium at 233°K. Other subjects include continuation of work in noble gas anoxia and studies of heme enzymes activity in aqueous NH_3. C.T.C.

N67-26353# Grumman Aircraft Engineering Corp., Bethpage, N. Y. Research Dept.
THE RELATION OF RADIATION INDUCED RESPIRATION DEFICIENCY TO CELL SURVIVAL IN THE YEAST—*SACCHAROMYCES CEREVISIAE*
W. Kunz Dec. 1966 20 p refs
(RM-349) CFSTI: HC $3.00/MF $0.65

X-ray dose-survival and dose-respiration deficiency curves were determined and the repair of reversible lethal radiation damage was studied for an asynchronous population of a strain of the yeast *Saccharomyces cerevisiae*. A decrease in the proportion of cells exhibiting respiration deficiency was found to be accompanied by an increase in cell survival (macrocolony forming ability). Two levels of recovery were observed. It is shown that the inverse relationship observed between respiration deficiency and survival supports the hypothesis that damage to the protein synthesis system is of prime importance in cell death. More exact interpretations as to mechanisms and sites of radiation interaction with cell constituents must await Z-spectra (energy density distribution) determinations and an analysis of the biological data with respect to these physical parameters. Author

N67-26372* Naval Medical Research Inst., Bethesda, Md. Dept. of Microbiology.
EFFECTS OF HIGH AND LOW BAROMETRIC PRESSURES ON SUSCEPTIBILITY AND RESISTANCE TO INFECTION Quarterly Status Report, 1 Jan.–31 Mar. 1967
Francis B. Gordon 31 Mar. 1967 14 p
(NASA Order R-21-010-010)
(NASA-CR-84073; L-97-464) CFSTI: HC $3.00 CSCL 06S

Observations are reported on the fecal flora of mice observed over a period of 16 weeks, the parabaric groups being maintained in decreased and increased pressures but with a normal pO_2. A transient increase in *Klebsiella* was seen in the two parabaric groups compared to controls, and a more sustained increase in a *Streptococcus*. An experiment using *Salmonella typhimurim* as a challenge agent in parabaric mice (increased O_2) is reported. Borderline differences were seen between control and test groups; the experiments must be repeated before an interpretation is possible. Experiments completed to date, using the mouse pneumonitis agent *(Chlamydia)* as a respiratory tract challenge pathogen, are summarized. The microflora from 5 sites of the personnel involved in simulated diving tests were assayed. Progress has been quite satisfactory in study of interferon production under parabaric conditions at both the cellular and the animal level. Definite effects of alterations in O_2 were observed in cells in vitro, and in lung tissue of mice. Author

N67-26407* Consultants and Designers, Inc., Arlington, Va.
ON THE BIOLOGICAL EFFECTS OF HIGH ENERGY PROTONS [O BIOLOGICHESKOM DEYSTVII PROTONOV VYSOKOY ENERGII]
P. P. Saksonov, V. V. Antipov, V. S. Sharkov, and V. S. Morozov 12 Jul. 1965 7 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR, Biofizika (Moscow), v. 162, no. 3, 1965 p 688–690
(Contract NAS5-3760)
(NASA-CR-84099; ST-SB-SM-10353) CSCL 06R

The results of various experiments with mice and rats in regard to radiation-shielding properties of certain pharmaco-chemical agents during irradiation by protons with energies from 660 to 120 Mev, are discussed, drawing comparison with the simultaneous action on animals by γ-rays. The experiments have shown that optimum shielding effect was obtained with aminoethylisotiuron dihydrobromide (AET), 5-methoxytriptamine chlorhydrate and serotinin. When introducing these compounds, 50–70% of mice survived. By comparison with cystamine (≈50%), triptamine and 5-oxytriptophan (≈20%). Author

N67-26421 Woroncow (J.), San Diego, Calif.
PRINCIPAL TASKS OF SPACE BIOLOGY AND MEDICINE
V. I. Yazdovskiy [1966] 13 p Transl. into ENGLISH from Kosmich. Biol. i Med. (Moscow), 1966
CFSTI: $3.00

The application of space biology to the various human requirements and problems of space flight is discussed. The factors affecting space flight are considered under three main groups: (1) low barometric pressure, absence of molecular oxygen, ionizing radiation, unfavorable temperature conditions, and meteorite danger, (2) noise, vibration, acceleration, and weightlessness, and (3) artificial atmosphere, nutrition in weightlessness, work and rest cycle, isolation, limited movements, and emotional stress. C.T.C.

N67-26422 Woroncow (J.), San Diego, Calif.
CLOSED ECOLOGICAL LIFE SUPPORT SYSTEMS
V. I. Yazdovskiy [1966] 57 p refs Transl. into ENGLISH from Kosmich. Biol. i Med. (Moscow), 1966
CFSTI: $3.00

The requirements and feasibility of various closed ecological life support systems are discussed. The interrelation of organisms and the environment in natural biological systems is studied by ecology, and the ability of man to utilize the corresponding functions of plant and animal organisms is examined. Recommendations for life support systems of short, medium, and long duration space flights are included. C.T.C.

N67-26423 Woroncow (J.), San Diego, Calif.
ARTIFICIAL ATMOSPHERE FOR SPACESHIP CABINS
V. I. Yazdovskiy [1966] 22 p refs Transl. into ENGLISH from Kosmich. Biol. i Med. (Moscow), 1966
CFSTI: $3.00

A discussion is given of space cabin atmospheres with the ultimate goal of determining the basic physiological-hygienic requirements. The effects of breathing pure oxygen at various pressures for extended periods of time are considered, along with

the feasibility and advantages of using mixed gas atmospheres. It was found that the basic requirements for extended manned space flights are (1) absolute pressure between 300 and 900 mm Hg, (2) partial carbon dioxide pressure should not exceed 7.6 mm Hg, (3) partial oxygen pressure should be within 150 to 300 mm Hg, (4) relative humidity should be maintained at 30 to 70% at approximately 20°C, (5) temperature control should be feasible within 10° to 30°C, (6) air flow rate should not exceed 0.3 meters/sec, (7) pressure variation rate should not exceed 2 mm Hg/sec, and (8) trace contaminants content should not exceed the permissible concentration limits. C.T.C.

N67-26475
PHYSICO-CHEMICAL LIFE SUPPORT SYSTEMS FOR MANNED SPACE FLIGHTS
V. I. Yazdovskiy 1966 53 p refs Transl. into ENGLISH of the book "Kosmicheskaya Biologiya i Meditsina" Moscow, Izd-Vo Nauka, 1966 CFSTI: $3.00

Air conditioning, closed and open oxygen air regeneration, and food and water recovery life support systems for manned space flight vehicles are discussed. Absorber, filtering, thermal dissociation, and other systems for removing carbon dioxide and other harmful ingredients from the cabin atmosphere are described. Weight factors, efficiency, and reliability of the systems discussed are considered. Means of maintaining proper humidity in the cabin are described. Block diagrams of many of the systems are given; and specific systems for Vostok spacecraft are outlined. L.S.

N67-26449*# Neurosciences Research Program, Brookline, Mass.
SIMPLE SYSTEMS FOR THE STUDY OF LEARNING MECHANISMS—A REPORT OF AN NRP WORK SESSION, VOLUME 4, NUMBER 2, 2–3 JUNE 1965
Theodore Holmes Bullock (Calif. Univ., Los Angeles) 30 Nov. 1966 129 p refs
(Grant NsG-462)
(NASA-CR-84118) CFSTI: HC $3.00/MF $0.65 CSCL 05J

Several actual and potential biological preparations were considered and compared as convenient vehicles for the study of learning mechanisms. The preparations discussed ranged from paramecia to the lower vertebrates, although interest was centered on insects (particularly locusts and cockroaches) and mollusks. The overall objectives of the session were defined as an attempt to examine the heuristic opportunities presented by a number of promising preparations or simplified systems; to assess the results and conceptual questions that experimental design can illuminate; and to stimulate the discovery of new and favorable materials for studying the mechanisms underlying learning. M.G.J.

N67-26495# School of Aerospace Medicine, Brooks AFB, Tex.
THE EFFECT OF OXYGEN ON DOG PLASMA SULFHYDRYL GROUPS IN VITRO
Methodius J. Bartek Jan. 1967 12 p refs
(SAM-TR-67-5; AD-648127) CFSTI: HC $3.00/MF $0.65

A method is described in which biologic fluids are continuously exposed to a test atmosphere, and sampling is achieved without disruption of the atmosphere. Samples are withdrawn at intervals and analyzed for sulfhydryl content by amperometric titration with the rotating platinum electrode using $AgNO_3$ as the titrant. Inasmuch as this project was undertaken to study the effect of oxygen on sulfhydryl-containing enzymes in vitro, the system was first evaluated using dog plasma as the source of protein. The decrease in dog plasma sulfhydryl content over a 4-hour exposure was: 9.3% for nitrogen, 24.7% for air, and 39.2% for oxygen. Author (TAB)

N67-26503*# George Washington Univ., Washington, D. C. Biological Sciences Communication Project.
NASA CONTRACT LISTINGS OF PUBLICATIONS UNDER THE BEHAVIORAL BIOLOGY PROGRAM
L. A. Kulp, Frances Hong, and Shiela Rollins, comp. Feb. 1967 52 p refs
(Contract NSR-09-010-027)
(NASA-CR-84161) CFSTI: HC $3.00/MF $0.65 CSCL 06S

The publications resulting from research supported, at least in part, by the Behavioral Biology Branch of the National Aeronautics and Space Administration's Bioscience Program Division are listed. A few publications, however, predate the establishment of this office but are included because they resulted from efforts which were subsequently subsumed under this program branch. Each project, indexed alphabetically according to principal investigator, reveals the published activity of each contractual endeavor. Author

N67-26542*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ANALYSIS OF SELF-LOCOMOTIVE PERFORMANCE OF LUNAR EXPLORERS BASED ON EXPERIMENTAL REDUCED-GRAVITY STUDIES
Donald E. Hewes Washington, NASA, May 1967 21 p refs
(NASA-TN-D-3934) CFSTI: HC $3.00/MF $0.65 CSCL 06K

An analysis of some measurements of metabolic costs of various lunar and corresponding earth locomotive activities has been made to determine the performance capabilities of man in carrying out lunar exploration. Comparisons of limited data from different sources have been made to establish the validity of the data obtained in simulated lunar gravity and used as the basis of this analysis. Various factors such as fatigue limit of the subjects, duty cycle, speed of locomotion, and lunar surface slope have been taken into account. The results of the analysis indicate that the performance of the lunar explorer will be significantly greater than that of his earthly counterpart wearing the same equipment, and that there is a very great need for evaluating the pressure suits actually intended for lunar locomotive activities in the simulated lunar gravity condition because of the gross effects of gravity on the locomotive performance. Author

N67-26551*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
THERMAL CONTROL CONSIDERATIONS FOR A MANNED ORBITING SPACE STATION
J. Thomas Taylor Washington, NASA, May 1967 48 p
(NASA-TN-D-3995) CFSTI: HC $3.00/MF $0.65 CSCL 22A

This report analyzes the advantages of combined passive and active methods for the thermal control of a Manned Orbital Laboratory. The object was the reduction of the space radiator heat load by rejecting the heat into space through the module walls. This was done by using external surface coatings. Analyses were conducted on two laboratories, each with crews of 18 and 24 men, at three different power levels. A combination passive and active system is recommended. Author

N67-26561*# National Aeronautics and Space Administration, Washington, D. C.
GUARANTEEING RADIATION SAFETY DURING THE VOSKHOD AND VOSKHOD-2 FLIGHTS [OBESPECHENIYE RADIATSIONNOY BEZOPASNOSTI PRI POLETAKH KORABLEY "VOSKHOD" I "VOSKHOD-2"]
Yu. M. Volynkin, V. V. Antipov, B. I. Davydov, N. N. Dobrov, M. D. Nikitin et al Nov. 1966 6 p refs Transl. into ENGLISH of a Paper Presented at the 17th Intern. Astronautical Congr., Madrid, 9–15 Oct. 1966
(NASA-TT-F-10409) CFSTI: HC $3.00/MF $0.65 CSCL 06R

The radiation doses absorbed by the crews of Voskhod and Voskhod-2 spacecraft was discussed. The space walk by cosmonaut Leonov exposed him to a greater dose, requiring the use of a special protective space suit. The various sources of space radiation and the protection against them are examined. Some of the experiments performed by the cosmonauts concerning space radiation are also considered. Author

N67-26567*# National Aeronautics and Space Administration, Washington, D. C.

MODELLING ENERGY EXCHANGE PROCESSES IN ECOLOGICAL SYSTEMS [MODELIROVANIYE PROTESSESSOV ENERGOOBMENA V EKOLOGICHESKIKH SISTEMAKH]

A. B. Rubin Nov. 1966 5 p refs Transl. into ENGLISH of a paper presented at the 17th Intern. Astronautical Congr., Madrid, 9–15 Oct. 1966

(NASA-TT-F-10408) CFSTI: $3.00 CSCL 06K

A discussion is presented on the mathematical modelling of the process of energy exchange between separate links in an ecological complex. An artificial ecological complex is viewed as a closed system, with energy and mass exchange being a sequential, branched chain. A chain consisting of three components is considered as an example. Author

N67-26573*# National Aeronautics and Space Administration, Washington, D. C.

THE EFFECT OF PROLONGED ACCELERATION ON GAS EXCHANGE AND RESISTANCE OF RATS TO HYPOXIA [O VLIYANII PRODOLZHITEL'NYKH USKORENIY NA GAZOOBMEN I USTOYCHIVOST' K GIPOKSII U KRYS]

A. A. Gyurdzhian Nov. 1966 5 p refs Transl. into ENGLISH of a Paper Presented at the 17th Intern. Astronautical Congr., Madrid, 9–15 Oct. 1966

(NASA-TT-F-10406) CFSTI: $3.00 CSCL 06C

An investigation is made of the effect of prolonged acceleration on gas exchange and resistance of rats to hypoxia. An automatic gas-exchange investigating stand is described. It is found that in rats subjected to an increased force of gravity the gas exchange was lower than in control rats. The resistance of rats to "fatal hypoxia" proved to be higher than that of control rats. The resistance of test rats to "fatal acceleration", however, was lower than that of the control rats. Author

N67-26574*# National Aeronautics and Space Administration, Washington, D. C.

FUNDAMENTALS OF HUMAN BIOMECHANICS IN AN UNSUPPORTED SITUATION [OSNOVY BIOMEKHANIKI CHELOVEKA V BEZOPORNOM POLOZHENII]

V. I. Stephantsov and A. V. Yeremin Nov. 1966 6 p Transl. into ENGLISH of a Paper Presented at the 17th Intern. Astronautical Congr., Madrid, 9–15 Oct. 1966

(NASA-TT-F-10411) CFSTI: $3.00 CSCL 06S

The problem of orientation in space by man through his own efforts is discussed. Rotation of the body in weightlessness, the effect of moving one or both arms and the legs, and the most effective methods of rotating in a supportless situation are among the subjects treated. Rotation with the help of legs was found to be most effective. On the basis of the results presented the authors assert that after special training a man in a supportless situation will be able to orient himself quickly and accurately in any direction solely by his own muscular effort. Author

N67-26575*# National Aeronautics and Space Administration, Washington, D. C.

THE PROBLEM OF PROLONGED, AUTONOMOUS HUMAN EXISTENCE IN A SPACE SUIT [K PROBLEME DLITEL'NOGO AUTONOMNOGO SUSHCHETSTVOVANIYA CHELOVEKA V KOSMICHESKOM SKAFANDRE]

A. M. Genin and L. G. Golovkin Nov. 1966 9 p Transl. into ENGLISH of a paper presented at the 17th Intern. Astronautical Congr., Madrid, 9–15 Oct. 1966

(NASA-TT-F-10413) CFSTI: $3.00 CSCL 06K

The feasibility of maintaining the thermal balance of a cosmonaut in a space suit utilizing only physiological perspiration is considered. Two series of tests were conducted in a thermal pressure chamber to determine the degree of intensity of physiological heat control and the performance capacity and the general condition of an organism. On the basis of the experiments it is asserted that for a period of 3 to 4 hours a man in a space suit is able to dissipate by the evaporation of perspiration 200–220 kcal/hr of heat produced either internally or externally. When the total thermal load is decreased, the duration a man can withstand such condition is greatly increased. Author

N67-26576*# National Aeronautics and Space Administration, Washington, D. C.

THE TRANSFORMATION OF HUMAN METABOLIC PRODUCTS AND PRODUCTS OF A BIOLOGICAL COMPLEX DURING THE RECIRCULATION OF SUBSTANCES IN SMALL, CLOSED SPACES [O TRANSFORMATSII PRODUKTOV ZHIZNEDEYATEL'NOSTI CHELOVEKA I BIOKOMPLEKSA PRI OSUSHCHESTVLENII KRUGOVOROTA VESHCHESTV V MALYKH ZAMKNUTYKH PROSTRANSTVAKH]

V. I. Yazdovskiy, A. L. Agre, B. G. Gusarov, Yu. Ye. Sinyak, S. V. Chizhov et al Nov. 1966 9 p Transl. into ENGLISH of a Paper Presented at the 17th Intern. Astronautical Congr., Madrid, 9–15 Oct. 1966

(NASA-TT-F-10405) CFSTI: HC $3.00/MF $0.65 CSCL 06S

A discussion is presented on the problems involved in creating life-support systems on the basis of recirculation of substances in closed spaces. The three stages identified are: (a) completely closed cycle, including regeneration of water, purification of the atmosphere, and providing man with food; (b) partially closed cycle, including regeneration of water and the atmosphere and obtaining food products of plant origin with the existence of an unreplenished supply of food products of animal origin; (c) open life-support system leased on supplies of food but including regeneration of water and atmosphere. Mineralization of solid and dehydrated waste products is discussed. Author

N67-26578*# National Aeronautics and Space Administration, Washington, D. C.

AN EXPERIMENT IN USING MICROCUVETTES MANUFACTURE OF THIN GLASS STRIPS, PLATES, AND COVER GLASSES BY DRAWING SHEET GLASS [OPYT PRIMENENIYA MIKROKYUVET. IZGOTOVLENIYE TONKIKH STEKLYANNYKH LENT, PLASTIN I POKROVNYKH STEKOL RASTYAGIVANIYEM LISTOVOGO STEKLA]

B. V. Perfil'yev and D. R. Gabe Feb. 1967 19 p Transl. into ENGLISH from the book "Capillary Methods of Investigating Microorganisms" Moscow, Izd. Akad. Nauk SSSR, 1961 p 213–221, 463–470

(NASA-TT-F-10728) CFSTI: HC $3.00/MF $0.65 CSCL 06L

A description of a special inovulation chamber for implanting isolated microbe cells is given. The microcuvettes are designed for growing cultures and observation under a microscope. The second article reviews plate glass manufacture in the USSR, and discusses the fabrication of microscope cover glasses. Author

N67-26580*# Holman (John F.) and Co., Inc., Washington, D. C.
UTILIZATION OF AMINO ACIDS OF L-CONFIGURATION AND d-CONFIGURATION BY B. BREVIS CULTURES [UTILIZATSIYA AMINOKISLOT L- AND d-KONFIGURATSII KUL'TURAMI B. BREVIS]
A. S. Konikova and N. N. Dobbert Washington, NASA, Apr. 1967 11 p refs Transl. into ENGLISH from Biokhimiya (Moscow), v. 13, no. 2, 1948 p 115–123
(Contract NASw-1495)
(NASA-TT-F-10887) CFSTI: $3.00 CSCL 06A

Cultures of B. brevis were grown on media containing various amino acids as sources of nitrogen and carbon to determine the specificity of the utilization of these acids by this bacteria. It was found that growth occurred on media containing l-monoamino carbonic acids, l-diamino carbonic acids, l-proline, l-histidine, and glycine. Glucose added to these media stimulated growth. Growth absolutely did not occur on leucine, isoleucine, oxyproline, tryptophane, or tyrosine. Glucose did not alter this situation. The proteins of B. brevis were found to have a specific structure containing d-amino acids. Author

N67-26599*# National Aeronautics and Space Administration, Washington, D. C.
MEASUREMENT OF LOW FREQUENCY VIBRATIONS IN BIG HELICOPTERS AND THEIR TRANSMISSION TO THE PILOT [MESURE DES VIBRATIONS DE BASSE FREQUENCE SUR HELICOPTERE LOURD ET LEUR TRANSMISSION AU PILOTE]
H. Seris and R. Auffret May 1967 16 p refs Transl. into ENGLISH from the book "AGARD Collected Papers Presented at the 22nd Meeting of the AGARD Aerospace Medical Panel" Sep. 1965 p 245–257
(NASA-TT-F-471) CFSTI: HC $3.00 CSCL 05H

Analyses are presented of the vibrations recorded at the seat level and on the sternum and cranium of the pilot. Sources are identified as (1) very low frequency vibrations due to atmospheric turbulence occurring at low altitudes and in clouds; and (2) vibration caused by mechanical factors in the main rotor and the anti-torque rotor. The frequencies transmitted to the cockpit are multiples of the number of blades of the frequency of rotor rotation. The helicopter used produced mechanical vibrations of 20 Hz and above, caused principally by the main rotor. The damping function of the body upon increased frequencies is demonstrated, with the resonant frequencies of the human body found in the 4 to 6 Hz region in seated subjects. Between 25 and 30 Hz, an over-acceleration of the head in relation to the shoulder was observed. Author

N67-26624*# National Aeronautics and Space Administration, Washington, D. C.
CERTAIN PROBLEMS RESULTING FROM EFFECTS OF ACCELERATION DURING SPACE FLIGHT (EFFECTS OF CUMULATION AND ADAPTATION) [NEKOTORYYE PROBLEMY DEYSTVIYA PEREGRUZOK V KOSMICHESKOM POLETE]
A. R. Kotovskaya Nov. 1966 19 p refs Transl. into ENGLISH from Russian Presented at the 17th Intern. Astronautical Cong., Madrid, 9–15 Oct. 1966
(NASA-TT-F-10412) CFSTI: HC $3.00/MF $0.65 CSCL 06S

An investigation was performed in order to make a comprehensive study of clinico-physiological, biochemical, hematological, roentgenological, and pathomorphological changes occurring in the organism of animals subjected to one-time or repeated effects of acceleration. The tests conducted used 50 dogs and 13 monkeys. A maximum tolerable duration to an acceleration of 12 g units was established for the monkeys. A correlation of changes in the roentgenological, clinical, and pathomorphological pictures was established. Repeated exposure to acceleration in the organism of an animal may cause various adaptive and cumulative damaging effects. Author

N67-26625*# National Aeronautics and Space Administration, Washington, D. C.
PROBLEMS OF BIOTELEMETRY DURING PROLONGED SPACE FLIGHTS [PROBLEMY BIOTELEMETRII V DLITEL NYKH KOSMICHESKIKH POLETAKH]
I. T. Akulinichev, A. M. Zhdanov, and I. I. Popov Nov. 1966 11 p Transl. into ENGLISH from Russian Presented at the 17th Intern. Astronautical Cong., Madrid, 9–15 Oct. 1966
(NASA-TT-F-10404) CFSTI: HC $3.00/MF $0.65 CSCL 06B

Some of the problems encountered in the use of the telemetry and other information-measuring devices on future spaceships are discussed. Results are presented from investigations conducted for the purpose of perfecting means for the improvement of space flight safety. A discussion is given on the selection of physiological, hygienic, and psychomotor parameters needed to carry out scientific research and other tasks on spacecraft. Author

N67-26626*# National Aeronautics and Space Administration, Washington, D. C.
AN INFORMATION MODEL OF THE EXTRAVEHICULAR DYNAMICS OF COSMONAUT BODY MOVEMENTS AND SPATIAL ORIENTATION [INFORMATSIONNAYA MODEL DINAMIKI DVIZHENIYA I PROSTRANSTVENNAYA ORIENTIROVKA KOSMONAVTA VNE KORABLYA]
V. A. Popov, Yu. A. Rozanov, and M. M. Sil'vestrov Nov. 1966 7 p Transl. into ENGLISH from Russian Presented at the 17th Intern. Astronautical Cong., Madrid, 9–15 Oct. 1966
(NASA-TT-F-10407) CFSTI: HC $3.00/MF $0.65 CSCL 05H

An investigation of an information model of the extravehicular dynamics of cosmonaut body movements and spatial orientation is discussed. It is found that a cosmonaut's individual movement control system must include motors to ensure rotation with respect to three mutually perpendicular axes and linear movement, controls, stabilization circuits, and an information model which provides the cosmonaut with data on spatial orientation and movement parameters. Detailed treatment is given to the information model of the control process. Author

N67-26632*# National Aeronautics and Space Administration, Washington, D. C.
PROBLEMS IN PHARMACOLOGY IN SPACE MEDICINE [PROBLEMA FARMAKOLOGII V KOSMICHESKOY MEDITSINE]
V. Ye. Belay, P. V. Vasil'yev, and G. D. Glod Nov. 1966 16 p refs Transl. into ENGLISH from Russian Presented at the 17th Intern. Astronautical Cong., Madrid, 9–15 Oct. 1966
(NASA-TT-F-10410) CFSTI: HC $3.00/MF $0.65 CSCL 06O

The efficient use of drugs in the preparation for and medical support of distant space flights is discussed. Some trends in the possible use of drugs during space flight already detectable include: (1) stimulation of natural compensatory-adaptive mechanisms of organisms to produce increased resistance to extreme factors; and (2) prevention of infectious, neuropsychic, and somatic diseases and radiation damage; (3) treatment of current diseases; and improving work capability (relieving fatigue and neuroemotional tension). Many drugs in conventional use and some specific drugs for space applications are considered in detail. Author

N67-26681# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ENGINEERING PSYCHOLOGY
A. N. Leont'yeva, V. P. Zinchenko, and D. Yu. Panova 31 Oct. 1966 719 p refs Transl. into ENGLISH of the book "Inzhenernaya Psikhologiya" Moscow, Izd. Mosk. Univ., 1964 p 1–396
(FTD-HT-66-147; TT-67-61001; AD-646960) CFSTI: HC $3.00/MF $0.65

An engineering psychology textbook dealing with human operator performance, sensory perception, and information theory related to automatic control systems is presented. For individual titles see N67-26682–N67-26700. M.W.R.

N67-26682# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PROBLEMS OF ENGINEERING PSYCHOLOGY

V. P. Zinchenko, A. N. Leont'yeva, and D. Yu. Panova *In its* Eng. Psychology 31 Oct. 1966 p 2–37 refs (See N67-26681 14-05)

Man is considered as the subject of working activity or as a special link in automated systems, and the general characteristics of his activities in an automated control system are discussed. The main task of engineering psychology is determining the capacity of the human operator with information control models that represent real devices. Effective encoding of information and the speed of perception are discussed, and a sequence is listed for the creation of a language for an automated system. Problems of contemporary engineering psychology are noted. M.W.R.

N67-26683# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

GENERAL CONCEPTS OF INFORMATION THEORY AND THEIR APPLICATION IN PSYCHOLOGY AND PSYCHOPHYSIOLOGY

L. V. Fatkin *In its* Eng. Psychology 31 Oct. 1966 p 38–70 refs (See N67-26681 14-05)

Basic concepts of information theory are described in terms of applicability to psychological and psychophysiological research. Since all cases of transmitting qualitatively different data must be reduced to a generalized abstract system of communication lines, the functional parts of a block diagram to accomplish this are detailed. The quantitative evaluation of information is then discussed, as are the transmission of signals along the communications channels and the psychophysiological peculiarities of human perception. The "throughput capacity" of the human sensomotor systems is considered, and various experimental results are cited. Rate of information perception, the mechanism of eye movements, and the existence of an inertial visual image are discussed. M.W.R.

N67-26684# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STATISTICAL ANALYSIS OF PERCEPTION PROCESSES

L. V. Fatkin *In its* Eng. Psychology 31 Oct. 1966 p 71–89 refs (See N67-26681 14-05)

A geometrical model of a generalized system for the transmission and reception of messages permits the three-dimensional study of fairly complex perception mechanisms. Recognition of phonemes, study of the tactile analyzer, and analysis of a perception model are discussed; and mathematical methods for estimating the quantity of received information are considered. M.W.R.

N67-26685# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

METHOD OF QUANTITATIVE ANALYSIS OF THE PERCEPTION OF SPATIAL AND SPATIO-TEMPORAL RELATIONS

V. Ya. Dymerskiy *In its* Eng. Psychology 31 Oct. 1966 p 90–122 refs (See N67-26681 14-05)

Perception of the spatial and spatio-temporal interrelationships of objects are considered as system elements; and the mapping of these characteristics is discussed. Direct mapping of the system elements are termed sensation, while the indirect mapping is referred to as perception. Attention is given to the accuracy of perceptive processes, as well as to thresholds for feeling and perception; and a quantitative analysis is made of the processes of indirect mapping of characteristics of the elements in a system. Accuracy and reliability of perception methods are considered. M.W.R.

N67-26686# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STATISTICAL MODEL OF THE OBSERVER

Ye. N. Sokolov *In its* Eng. Psychology 31 Oct. 1966 p 123–188 refs (See N67-26681 14-05)

The application of statistics to signals and reactions is treated in terms of the observer and the schematization of his activities, and the theory of an ideal observer is discussed. Methods of tracking stimuli, sources of fluctuation in observer response, and criteria for actual and false responses are discussed. Since the peculiarities of observer activity are not external manifestations of mental activity aimed at the detection and recognition of signals, the use of electroencephalography is suggested as an approach to the study of human responses. Statistical structure of the working level of observer performance is considered, along with fluctuations and EEG response thresholds. Fluctuations of the "inherent light of the retina", artificially introduced and naturally established working level, and effective absolute threshold are examined. The concepts of effective absolute threshold and true absolute threshold are introduced. M.W.R.

N67-26687# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

METHODS AND SYSTEMS OF AUTOMATIC ANALYSIS OF BRAIN BIOCURRENTS

V. D. Nebylitsyn *In its* Eng. Psychology 31 Oct. 1966 p 189–219 refs (See N67-26681 14-05)

Computerized and other automatic methods for the analysis of brain biocurrents are discussed in light of various experimental studies in the literature. Frequency analyses of the electroencephalograms are considered, along with the use of autocorrelation and cross correlation methods. Detection of elicited potentials obtained on animals under narcosis and immobilized with curare indicate both specific and nonspecific electrical responses in the cortex and other brain structures. New developments in electroencephalography are noted, including the use of periodometric analysis of EEGs. Use of digital computing techniques for analysis of results is also considered. M.W.R.

N67-26688# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ANALYSIS OF HUMAN OPERATOR PERFORMANCE

V. P. Zinchenko, N. I. Mayzel'; A. I. Nazarov, and A. A. Tsvetkov *In its* Eng. Psychology 31 Oct. 1966 p 220–251 refs (See N67-26681 14-05)

The optimum organization of human operator performance is discussed in terms of the distribution of functions between man and machine, the interaction of individuals in control systems, human throughput capacity, and criteria and conditions with regard to accuracy and reliability. Analysis of operator performance is also considered in terms of the development of training and selection methods. State of reception and coding of information, other aspects of information processing, and various types of solutions used to determine performance are treated; and a tentative classification of human operator activity is proposed. M.W.R.

N67-26689# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PSYCHOLOGICAL CHARACTERISTICS OF HEARING

L. A. Chistovich *In its* Eng. Psychology 31 Oct. 1966 p 252–288 refs (See N67-26681 14-05)

The absolute sensitivity of hearing is discussed, and thresholds are considered for complex sounds and unpleasant sensations.

Threshold and loudness are treated as functions of signal duration, and attention is given to differential intensity and frequency thresholds. Discrimination of the time structure of the signal is also discussed in terms of previously made studies. Studies dealing with the absolute recognition of sound signals are reviewed, as are those dealing with tonal masking. Auditory attention, its selectivity, and possible rate of switching are mentioned. M.W.R.

N67-26690# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SOME PSYCHOPHYSIOLOGICAL CHARACTERISTICS OF VISION

I. Ya. Grotov and G. N. Il'ina *In its* Eng. Psychology 31 Oct. 1966 p 289–343 refs (See N67-26681 14-05)

Soviet and other literature is reviewed for information on the parameters which characterize the visual system that must be considered in automatic perception systems. Parameters determining the visibility of objects are discussed, including angular size of the object, level of brightness adaptation, contrast between object and background, and shape of the object. An empirical formula is presented for the calculation of visibility parameters of objects, the temporal characteristics of visual perception are discussed, and eye movements of the observer and visual fatigue studies are reviewed. A discussion of so-called practical problems deals with observing both images on projection screens and signals in radar tubes. Illumination and brightness of screen and symbols, selection of colors for signals on a screen, and selection of rate of changing frames projected on the screen are treated. Some recommendations are offered for the design of calibration scales for instruments: and procedures for making studies are outlined. M.W.R.

N67-26691# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

EXPERIENCE IN EXPERIMENTAL INVESTIGATION OF THE FUNCTIONING OF AN OBSERVER'S VISUAL SYSTEM

Yu. B. Gippenreyter *In its* Eng. Psychology 31 Oct. 1966 p 344–405a refs (See N67-26681 14-05)

A hypothetical model of certain aspects of the activity of an operator–observer is used to investigate functioning of the human visual system. Particular attention is given to the simultaneous reception and deposition of information along several channels or in several portions of the observer's visual field. Principal experimental method was the recording of ocular movements. Temporal parameters of detection and identification of an object in the visual field were investigated, and characteristics of visual system functioning while seeing uniform multiple objects were studied. For the latter, inherent oculomotor noise and fixation and scanning experiments are discussed. In the experiments, false alarms and confusion due to blinking were noted. Also reported are certain parameters of the functioning of an operator's visual system during the reading of signals from large displays of figures. Recognition and the operative visual field is discussed. M.W.R.

N67-26692# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THEORETICAL PROBLEMS IN THE PSYCHOLOGY OF PERCEPTION

V. P. Zinchenko *In its* Eng. Psychology 31 Oct. 1966 p 406–466 refs (See N67-26681 14-05)

A genetic method is used to describe different levels of information transformation and to isolate individual perceptual operations. This method is considered particularly adequate for studies in bionics and engineering psychology, for which common logical simplifications are found to be ineffective. A discussion of criteria of perception concludes that each perceptual operation apparently has its own criteria for occurrence and productivity. Levels of perception are discussed in terms of the genetic approach, and natural methods for modeling stimuli are described, objective forms of modeling are noted, and sensory learning is discussed. Perceptual operations and actions are considered, as are recognitive actions and the probability approach to perception. M.W.R.

N67-26693# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PROBLEMS OF THE PSYCHOLOGY OF MEMORY AND INFORMATION THEORY

P. I. Zinchenko, P. B. Nevel'skily, N. I. Ryzhova, and V. P. Sologub *In its* Eng. Psychology 31 Oct. 1966 p 467–524 refs (See N67-26681 14-05)

The concept of memory as a subjective activity is considered as the basis of a critical analysis of various approaches to information theory, and an overview of world literature is presented on the application of information theory to problems related to the psychology of memory. Spontaneous recall is considered, as is recall of lists of material and the encoding of information to increase the memory capacity. Organization of material and redundancy influences on memory are treated, and symmetry is considered as an aspect of redundancy. Pattern recognition and memorization of nonsense syllables are discussed, along with the role of grouping material to enhance the memory process. The perceptron and other memory machines are noted, along with their limitations. A comparison of Soviet and American potentials for applying information theory to the psychology of memory is made. M.W.R.

N67-26694# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INFORMATION PROCESSING BY MAN IN THE CHOICE SITUATION

A. N. Leont'yev and Ye. P. Krinchik *In its* Eng. Psychology 31 Oct. 1966 p 525–580 refs (See N67-26681 14-05)

Human reaction time as a function of the amount of information received is studied in psychological experiments dealing with man's ability to process information. The Hicks and other models are discussed, and various numbers and kinds of stimuli are considered. Factors that influence the rate of information processing are noted; and a study is reported in which the difficulty in visual discrimination of the object leads to differences in the reaction time independent of entropy, under identical training conditions. Studies are reviewed in which the ratio of reaction time and amount of information is related to the factor called stimulus-response compatability; and the psychological characteristics of information processing by man are noted. The role of the significance of the signal, and its influence on reaction time and on information content is considered; and the factor of signal significance is considered to regularly organize the behavior of man. M.W.R.

N67-26695# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INVESTIGATION OF SENSOMOTOR RESPONSES AND MOTOR HABITS

A. I. Nazarov *In its* Eng. Psychology 31 Oct. 1966 p 581–604 refs (See N67-26681 14-05)

Basic factors that affect the speed and accuracy of sensory motor responses are examined, and the mechanisms that regulate motor habits are considered. A simplified model is presented of a semiautomatic system controlled by manual movements of the operator, and a time-motion diagram is introduced to indicate the variables that influence the characteristics of the operators' movements. Speed of response reactions are considered in terms of the transmission time of impulses from the receptor to the central nervous system, and the time required for the organization of the response reactions. Psychological refractory phase is discussed as are the mechanisms of movement control. M.W.R.

N67-26696# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ON THE "NOISE RESISTANCE" OF THE OPERATOR

F. D. Gorbov *In its* Eng. Psychology 31 Oct. 1966 p 605–637 refs (See N67-26681 14-05)

Healthy young flying personnel with approximately the same general and specialized training are shown to have different resistances to noise, and experience and training are shown to influence the noise resistance or noise suppression capacity of these human operators. Test subjects worked with a numerical table on which black and red figures were arranged in random combinations in 49 squares, and numbers in the various squares had to be read in specified orders. The action of noise stimuli on the operator assumed particular importance when the operator's activity was continuous and when there was a need for a steady current of information signals. M.W.R.

N67-26697# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

RELIABILITY OF OPERATOR PERFORMANCE IN A COMPLEX CONTROL SYSTEM

V. D. Nebylitsyn *In its* Eng. Psychology 31 Oct. 1966 p 638–657 refs (See N67-26681 14-05)

Reliability and effectiveness of human operator performance in a semiautomatic complex control system is treated both qualitatively and quantitatively. Breakdowns or errors due to sleep, blackout, or other factors are considered; and various industrial reliability concepts are applied to the human operator. These include mean duration of work between breakdowns, total number of breakdowns, percentage of completed tasks, and probability of satisfactory performance for a given period of time. Factors determining human operator performance are discussed, including influence of maintenance personnel, degree of training, personal factors involving the cardiovascular and nervous system, and psychological factors. Long-term endurance, noise resistance, spontaneous distraction, reactions to unpredicted stimuli, switching ability, and resistance to environmental factors are discussed in terms of their influence on performance. M.W.R.

N67-26698# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ACCURACY OF OPERATOR PERFORMANCE AND ERROR CHARACTERISTICS

B. F. Lomov *In its* Eng. Pscyhology 31 Oct. 1966 p 658–680 refs (See N67-26681 14-05)

From a psychological point of view, the problem of accurate operator performance is considered as the formation of an adequate image of the controlled object or process and the corresponding controlled action that results. In order to predict the errors that man will make, it is therefore necessary to consider the role of the object or process, the equipment, and the working conditions in controlling man's actions. The accuracy of the performance of a control system is dependent to a considerable degree on the operator. A general discussion of the control system, human errors and overall performance, and the man–machine system is included. M.W.R.

N67-26699# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ON THE PROBLEM OF THE STABILITY OF OPERATOR PERFORMANCE IN A CONTROL SYSTEM

M. M. Novoselov *In its* Eng. Psychology 31 Oct. 1966 p 681–691 refs (See N67-26691 14-05)

A method is proposed for determining the stability, or freedom from error, of human operator performance in a control system. While the method does not indicate concrete deficiencies in the equipment design, it does indicate the suitability of the design as a whole. The concept of breakdown of man–machine systems is considered, along with criteria of breakdown-producing operator function and psychophysiological aspects of operator performance. The empirical function of the stability of operator performance in the system is determined mathematically, as is breakdown probability. M.W.R.

N67-26700# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PSYCHOLOGICAL PROBLEMS OF PERSONNEL SELECTION

N. I. Mayzel', V. D. Nebylitsyn, and B. M. Teplov *In its* Eng. Psychology 31 Oct. 1966 p 691–712 refs (See N67-26681 14-05)

Psychological and physical problems in the selection of aviation, military, and industrial personnel are discussed; and the need for precise knowledge of working conditions, the job to be done, and the available personnel is stressed. Both the trainability of the individual and his performance under real working conditions are considered. Personal attributes of the human operators, and means of compensating for weaknesses are also discussed in this general presentation. M.W.R.

N67-26714# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.

PROCEEDINGS OF THE 2nd ANNUAL CONFERENCE ON ATMOSPHERIC CONTAMINATION IN CONFINED SPACES, 4 AND 5 MAY 1966

Dec. 1966 338 p refs

(AMRL-TR-66-120; AD-646512) CFSTI: HC $3.00/MF $0.65

Conference papers are presented covering such major technical areas as toxicology of space cabin materials, comparative toxicology and pathology of oxygen, and the effects of oxygen on contaminant toxicity. For individual titles, see N67-26715 through N67-26735.

N67-26715# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

PARTS AND MATERIALS DATA RETRIEVAL PROGRAM RELATIVE TO MATERIALS SELECTION IN TOXICOLOGY

Elliott S. Harris *In* AMRL Proc. of the 2d Ann. Conf. on Atmospheric Contamination in Confined Spaces Dec. 1966 p 9–13 (See N67-26714 14-04)

Described is a data retrieval system that was established to centralize the data obtained by manufacturers and test organizations; to reduce redundancy of testing effort to a minimum; and to provide a basis for toxicological testing. Although this effort was initiated as a separate entity, it has been incorporated into an Apollo parts and materials master file on the premise that the nonmetallic materials used in the Apollo or LEM spacecraft will not differ too greatly from future generation spacecraft. The master file provides a program of parts and materials used in the Apollo and LEM spacecrafts. The computer will printout the nonmetallic materials on a selective basis and provide information which not only allows the identification of the material in question, but also the manufacturer of the material, its specifications, the contractor who used the material, the spacecraft on which the material is used, and the location within the spacecraft. Provisions are also made for the inclusion and retrieval of off-gassing rates, total quantities of gases released under specific test conditions, and the compounds which are identified. Studies designed to analyze closed environments for the purpose of identifying man's contribution to the microcontaminant picture, are also cited. The information retrieved from this data system will be used to establish areas of investigation for long term toxicity in closed environments. S.C.W.

N67-26716# Monsanto Research Corp., Dayton, Ohio.

GAS-OFF STUDIES OF CABIN MATERIALS

F. N. Hodgson and John V. Pustinger, Jr. *In* AMRL Proc. of the 2d Ann. Conf. on Atmospheric Contamination in Confined Spaces Dec. 1966 p 14–23 ref (See N67-26714 14-04)
(Contract AF 33(615)-1779)

Two programs designed to establish the gas-off and possible oxidation products from individual cabin materials using bench-scale environmental simulators, are described. Materials such as partially fabricated spacecraft components and freshly prepared paints and coatings are being evaluated. The test atmospheres are analyzed by a variety of gas chromatographic and mass spectrometric methods. Types of compounds detected in the chamber atmospheres include: inorganics, alkanes, alkenes, hydroxy compounds, ethers, alkyl halides, carboxylic acids and their derivatives, aldehydes, ketones, aliphatic nitrogen compounds, benzene and its homologs, aryl halides, and silicon compounds. Results of analyses of gas-off products from an epoxy resin, adhesive material, phenolic resin, and carbon monoxide and methane; are tabulated. It is concluded that: (1) Qualitative identification of gas-off components is possible to the level of 0.1 ppm in the gaseous atmosphere; (2) Whenever possible, materials should be evaluated in their final form and under the conditions of use; (3) Pretreatment of candidate materials should simulate conditions encountered in use; (4) To provide quantitative data for meaningful comparison between testing laboratories, some standardizations of sample preparation (size, shape, exposed surface, etc.) should be made; and (5) Estimates of the amounts of gas-off components can be made from mass spectrometry and gas chromatography analyses; however at extremely low levels, considerable variation in measurements can arise. S.C.W.

N67-26717# Aerojet-General Corp., Azusa, Calif.
TOXICOLOGICAL SCREENING OF SPACE CABIN MATERIAL
B. D. Culver *In* AMRL Proc. of the 2d Ann. Conf. on Atmospheric Contamination in Confined Spaces Dec. 1966 p 24–30 (See N67-26714 14-04)

Reported is the initiation of experiments designed to study toxicity of materials at reduced pressures under conditions similar to those found in space cabins. Presented are data on the design and construction of animal exposure chambers for Apollo toxicity screening tests. Preliminary studies of rats and mice are described. Conditions of exposure were 75°F ±5, 50% relative humidity ±10%, CO_2 concentration below 1/2%, and 5 psia total pressure. Animals were exposed for a week to each of four groups of materials which included: mixed groups of resins and mounting materials. Changes observed in animals exposed to mixed groups of resins included a slight loss of weight. Following the period of exposure, the animals were kept and observed for one week. It was found that these animals underwent a weight loss at a 0.01 level of statistical significance. Experiments are being planned to determine the biological significance of these findings. It is recommended that the analytical chemists be utilized in defining quantitatively atmospheric constituents, so that exposure systems can be designed to monitor classes of materials found in the atmosphere, and so that studies of the range of responses to total constituents in these various families or fractions can be initiated on a wider scale. S.C.W.

N67-26718# School of Aerospace Medicine, Brooks AFB, Tex.
CONTAMINANT STUDIES IN CLOSED ECOLOGICAL SYSTEMS AT THE USAF SCHOOL OF AEROSPACE MEDICINE
James P. Conkle *In* AMRL Proc. of the 2d Ann. Conf. on Atmospheric Contamination in Confined Spaces Dec. 1966 p 31–52 refs (See N67-26714 14-04)

Presented are results of a 27-day experiment at 760 mm Hg (oxygen, 20%; nitrogen, 80%) which was conducted to define the contaminants associated with human occupancy of a sealed environmental simulator; and an experiment of 56 days duration which was performed to evaluate the stability of a helium (30%)–oxygen (70%) atmosphere at 258 mm Hg. Rapid, initial increases in the carbon monoxide concentration were observed in both studies. The methane concentration during the 27-day experiment increased from 20.9 mg/m^3 the day after men entered the chamber to a high of 84.6 mg/m^3. The 56-day experiment methane concentrations ranged from a low of 4.7 mg/m^3 to a high of 13.7 mg/m^3. No significant data relating to organic compounds were obtained from the analysis of unconcentrated samples during either experiment. Thirty-nine compounds were reported during the 27-day experiment which were not reported during the 56-day study. Seven components were reported during the 56-day study which had not been reported during the 27-day study. Fifty-eight compounds were reported for both experiments. The atmospheres to which four human subjects were exposed for 14 days at 760 mm Hg and 56 days at 258 mm Hg were analyzed for trace contaminants. A total of 105 compounds were detected. The concentration of these compounds remained below a level thought to cause a physiologic effect. Carbon monoxide and carbon dioxide were the only compounds which were produced by man at such a rate that clearly would require removal in long term sealed atmospheric habitation. S.C.W.

N67-26719# Naval Research Lab., Washington, D. C.
A DANGEROUS CLOSED ATMOSPHERE TOXICANT, ITS SOURCE AND IDENTITY
Raymond A. Saunders *In* AMRL Proc. of the 2d Ann. Conf. on Atmospheric Contamination in Confined Spaces Dec. 1966 p 53–59 (See N67-26714 14-04)

Described is an incidence of organic contamination which was discovered during a Project MESA (Manned Environmental Systems Assessment) evaluation of a completely integrated and regenerative air, water, and biological life support system. The purpose of the evaluation was to determine the effectiveness of the system by maintaining five men in a completely closed system for 30 days. Symptoms after exposure to the MESA chamber atmosphere included a very distinct and sickening sour–sweet odor which became increasingly irritating to the crew; loss of appetite; nausea; itchiness around the eyes; headaches; sore gums; painful jaws; and severe cold sores. Of the various contaminants recovered from the MESA atmosphere, the most prevalent trace contaminant was trichloroethylene, which had been used in the chamber for cleaning purposes prior to the start of the manned test. The two uncommon compounds found were mono- and dichloroacetylene. Further studies indicated that dichloroacetylene was one contaminant in the MESA atmosphere which accounted for all of the rather unusual symptoms exhibited by the crew; and that its presence was attributable to the partial decomposition of its precursor, trichloroethylene, by the sodium superoxide unit. The MESA experiments document the first serious case of organic trace contamination in a confined environmental atmosphere which was serious enough to incapacitate a crew. The significance of these findings is that the causative agent was not a gas-off product from any cabin material, but a contaminant actually generated by the contaminant control system. S.C.W.

N67-26720# Aerojet-General Corp., Dayton, Ohio.
OXYGEN TOXICITY AT NEAR-AMBIENT PRESSURES
James D. MacEwen and Charles C. Haun *In* AMRL Proc. of the 2d Ann. Conf. on Atmospheric Contamination in Confined Spaces Dec. 1966 p 65–72 refs (See N67-26714 14-04)
(Contract AF 33(657)-11305)

Two experiments were conducted to determine if the observed mortality response of albino rats of the Wistar strain and Sprague–Dawley rats of the SPF strain was the result of exposure to environments of increased partial pressure of oxygen or decreased total pressure. The first experiment was carried out at near atmospheric pressure in the presence of 100% oxygen. The

Sprague–Dawley SPF strain rats and both young and old Wistar strain rats were used. The second experiment was conducted at near atmospheric pressure with an enrichment of oxygen to 260 mm Hg partial pressure. Primary objectives of these experiments were to determine whether the observed mortality response was a strain specific effect, and whether age influenced the degree of susceptibility to the environmental conditions. The experiments demonstrated a decreasing oxygen toxicity response with decreasing total pressure. Also demonstrated was a sex difference in toxic response between male and female rats, and a difference in response between young and older animals. The mortality rate of Wistar strain rats exposed to a 5 psia–100% oxygen environment was definitely ascribed to a strain-specific pressure sensitivity. In addition, a definite difference in toxic response was demonstrated between experiments conducted in dynamic flow and recirculating chamber systems. It appears that some metabolic waste materials or their oxidation products may be accumulated in a recirculating system which are capable of enhancing oxygen toxicity. S.C.W.

N67-26721# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
PATHOLOGICAL EVALUATION OF OXYGEN TOXICITY AT NEAR-AMBIENT PRESSURES
Farrel R. Robinson and David T. Harper, Jr. *In its* Proc. of the 2d Ann. Conf. on Atmospheric Contamination in Confined Spaces Dec. 1966 p 73–79 refs (See N67-26714 14-04)

Presented is a pathological evaluation of the effect of species, age, strain, and individual susceptibility on the type and severity of lesion induced by continuous exposure to high concentrations of oxygen at pressures of 600 to 760 mm Hg for periods up to 16 days in the Thomas Domes. Examined were rats, mice, dogs, and monkeys. It is shown that the type of pulmonary lesion induced by high concentrations of oxygen at pressures of 600 to 760 mm Hg depends upon the species, age, strain, and individual susceptibility of the experimental animal. Monkeys are apparently more resistant to acute oxygen toxicity than rats, but do develop an extreme subacute pulmonary proliferative response. Younger animals seem to have more resistance to high concentrations of oxygen than older animals. Pronounced differences in mortality, and consequently pulmonary lesions, indicate that a conventionally raised Harlan Sprague–Dawley strain of rats is more susceptible than either a Wistar strain or a specific pathogen free Carworth Sprague–Dawley strain. Differences in individual susceptibility of a supposedly homogeneous group of either monkeys or rats are evident; some animals die with acute lesions and others accommodate and later develop subacute lesions. It is therefore concluded that the pathologic response of the lung to high concentrations of oxygen is quite variable with many biological influences contributing to the ultimate pathologic picture. S.C.W.

N67-26722# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson, AFB, Ohio.
TOXICITY STUDIES ON ANIMALS EXPOSED CONTINUOUSLY TO A 5 PSIA 100% OXYGEN ENVIRONMENT FOR PERIODS UP TO 235 DAYS
Kenneth C. Back *In its* Proc. of the 2d Ann. Conf. on Atmospheric Contamination in Confined Spaces Dec. 1966 p 80–87 (See N67-26714 14-04)

Reported are clinical laboratory parameters obtained from toxicity studies of the effects of 100% oxygen at 5 psia on animals exposed continuously for periods up to 235 days. Presented are data for male mice, male rats (Sprague–Dawley), female and male beagle dogs, and male and female *Macaca mulatta* monkeys. All experimental animals were weighed and clinical baseline values were determined at least four times during the month before exposure. Tabulated are hematologic and serum chemistry clinical parameters for dogs and monkeys, operating parameters for the dome used in tests; mortality data; and hematologic data on all animals studied. Other studies were performed to obtain cellular enzyme data. S.C.W.

N67-26723# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
PATHOLOGY OF ANIMALS EXPOSED TO A PURE OXYGEN ATMOSPHERE AT REDUCED PRESSURE FOR PROLONGED PERIODS
David T. Harper, Jr. and Farrel R. Robinson *In its* Proc. of the 2d Ann. Conf. on Atmospheric Contamination in Confined Spaces Dec. 1966 p 88–102 refs (See N67-26714 14-04)

Gross and histological pathological changes observed in purebred beagle dogs, *Macaca mulatta* monkeys, Wistar rats, and male Harlan mice, after prolonged exposure to a pure oxygen atmosphere at reduced pressures; are reported. Data on mortality and the incidence of infectious disease are also reported. S.C.W.

N67-26724# Laboratory for Experimental Biology, St. Louis, Mo.
PATHOLOGY OF ANIMALS EXPOSED FOR 235 DAYS TO A 5 PSIA 100% OXYGEN ATMOSPHERE
O. E. Hagebusch *In* AMRL Proc. of the 2d Ann. Conf. on Atmospheric Contamination in Confined Spaces Dec. 1966 p 103–107 (See N67-26714 14-04)

Gross and histological pathological changes observed in rats, mice, monkeys, and dogs, after exposure for 235 days to a 5 psia 100% oxygen atmosphere; are reported. On the basis of experiments on this small group of animals, it is suggested that 258 mm Hg 100% oxygen for 230 days may be toxic for the dog. There was no evidence that this concentration was toxic for mice or monkeys under the same experimental conditions. To confirm these findings, dog and rat microscopic sections were reviewed by eight pathologists after the original findings had been recorded. Except for minor variations in degree of pathology thought to be present and some disagreement on the presence or absence of minor changes, all diagnoses were in agreement. It is the considered opinion that when dogs are exposed to 258 mm Hg 100% oxygen for 230 days, pathological changes are present in the lungs. It is thought that subtle changes may be present in rats at this same exposure; however, further studies are necessary before this can definitely be determined. Acute pulmonary pathology which is considered to be related to experimental conditions consists of various combinations of hemorrhage, edema, congestion, bronchiolitis, mucous plugs, edema and inflammation about vessels, thickening and proliferation of alveolar walls, interstitial pneumonia, atelectasis, and bronchial pneumonia. The temporal relationships of these changes are discussed. S.C.W.

N67-26725# Zurich Univ. (Switzerland).
ELECTRON MICROSCOPIC INVESTIGATIONS OF OXYGEN EFFECTS ON LUNG TISSUE
Gonzague S. Kistler, Ewald R. Weibel, and Peter R. B. Caldwell (AMRL Wright-Patterson, Air Force Base, Ohio) *In* AMRL Proc. of the 2d Ann. Conf. on Atmospheric Contamination in Confined Spaces Dec. 1966 p 108–161 refs (See N67-26714 14-04)
(Contract AF 61(052)-784)

Presented are results of electron microscopic and morphometric studies of rat lungs exposed to 98.5% oxygen at atmospheric pressure, and 97% oxygen at 258 Torr. The purpose of these studies was to establish the time-sequence of changes occurring in the lung as a result of continued breathing of pure oxygen at atmospheric pressure, and to elucidate the effects of breathing essentially pure oxygen at 5 psia for up to two weeks. The primary site of damage caused by pure oxygen breathing at 765 Torr appeared to be in the endothelial cells of the pulmonary capillaries with resultant movement of fluid into the interstitial and alveolar spaces. After 72 hours of oxygen exposure, the alveolo-capillary tissue barrier had doubled in thickness, the capillary bed was reduced in volume by about one half, and a profuse exudate containing numerous cells had covered about 65% of the alveolar space. These factors combined to progressively reduce the estimated diffusing capacity of the air–blood barrier to about 9% of its normal value. It appears that the basic toxic effect of oxygen must

be initiated rather early, that is towards the end of the first day of exposure, since all the observed effects must be secondary to some still unknown disturbance at the subcellular or even molecular level. The morphometric electron microscope study of lungs exposed to 97% oxygen at 5 psia (258 torr) revealed a reduction in specific gas exchange surface by about 27% after two weeks, with a concurrent decrease in capillary volume and surface. This change is interpreted as an oxygen effect, but cannot be called oxygen toxicity. It is rather regarded as an adaptive process of the growing organism to increased availability of oxygen in the breathing medium. S.C.W.

N67-26726# Mount Sinai Medical and Graduate Schools, New York.
ELECTRON MICROSCOPIC INVESTIGATIONS OF OXYGEN EFFECTS ON LIVER TISSUE
Fenton Schaffner *In* AMRL Proc. of the 2d Ann. Conf. on Atmospheric Contamination in Confined Spaces Dec. 1966 p 162–169 refs (See N67-26714 14-04)

Presented are results of electron microscopic studies of the livers of rats, dogs, and monkeys exposed to pure oxygen at pressures from 1/3 to 3 atmospheres, from three hours to eight months. The purposes of these studies were to determine the ultrastructural changes which occur in a metabolically active organ during hyperoxia, to gain some insight into the nature of oxygen toxicity on a cellular level, and to see whether adaptation to the new atmosphere develops. In rats, it was observed that the higher the atmospheric pressure the more rapidly hepatocellular alterations appeared. Sprague–Dawley rats showed more severe changes than Wistar rats but no differences could be found between males and females. Of the three species studied, the least changes in glycogen were present in dogs. Mitochondrial alterations were present and after 8 months at 258 mm Hg this was greatest in this species. The most striking finding was the large number of pigment-containing lysosomes and autophagic vacuoles. The glycogen depletion in monkeys was the same as in the rats. The mitochondrial changes were less striking and did not follow as clear a time sequence as in the rats. The livers of rats, dogs, and monkeys showed signs of mitochondrial alteration primarily; however, adaptation to the new atmosphere occurred although this process appears to be a continual one. Species differences were quantitative rather than qualitative. The major unanswered question in these studies was whether the livers of animals so exposed are more sensitive than normals to the action of other toxins. S.C.W.

N67-26727# Mount Sinai Hospital, New York.
ELECTRON MICROSCOPIC INVESTIGATIONS OF OXYGEN EFFECTS ON KIDNEY TISSUE
Willy Mautner *In* AMRL Proc. of the 2d Ann. Conf. on Atmospheric Contamination in Confined Spaces Dec. 1966 p 170–177 refs (See N67-26714 14-04)
(Contract AF 33(615)-1849)

Reported are results of electron microscopic studies of the kidneys of Sprague–Dawley rats, monkeys, and dogs exposed to hyperoxic environments. The purpose of these studies was to determine whether changes in the kidney renal cortical tissues after short term exposures were reversible after long term exposures. Changes in the renal cortex were confined to the cells of the proximal convoluted tubules. Distal tubules and collecting ducts were normal in both control and experimental groups. Two types of changes were found: mitochondrial alterations (in all species studied), and an increase in number of a small cell organelle in dogs and monkeys. These changes tended to revert to normal on prolonged exposure. S.C.W.

N67-26728# IIT Research Inst., Chicago, Ill.
CELLULAR BIOCHEMISTRY OF OXYGEN TOXICITY
Willis H. Riesen *In* AMRL Proc. of the 2d Ann. Conf. on Atmospheric Contamination in Confined Spaces Dec. 1966 p 178–199 refs (See N67-26714 14-04)

Reported are studies focusing on the biochemical aspects of oxygen toxicity at a cellular and a mitochondrial level. Presented are results of biochemical and morphological studies of rats exposed to atmospheres of pure oxygen at 760 mm Hg in the Felig–Lee environmental chamber, or in the same atmosphere at 750 to 760 mm Hg in the Thomas Dome. Biochemical studies included analyses of liver mitochondria, lung mitochondria, whole liver, whole lung, and arterial blood. In addition to changes in biochemical indices, changes in animal weight during exposure to oxygen or air were observed. The objective of the experimental exposures of animals to 1/3 atm of pure oxygen was to determine whether biochemical changes could be detected in animals exposed to atmospheres simulating those of manned space flight. Data on rats exposed in the Thomas Dome for as long as 236 days; dogs exposed to oxygen at 258 mm Hg in the Thomas Dome for 236 days; and monkeys exposed to oxygen at 258 mm Hg in the Thomas Dome for 236 days with a 40-day air recovery; are presented. Areas requiring further study such as the protective effect of lactate; the effects of oxygen exposure upon specific enzyme systems; and the development of instrumentation of greater sensitivity and precision; are cited. S.C.W.

N67-26729# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson, AFB, Ohio.
HEMATOLOGIC EFFECTS OF INCREASED OXYGEN TENSIONS
Harold P. Kaplan *In its* Proc. of the 2d Ann. Conf. on Atmospheric Contamination in Confined Spaces Dec. 1966 p 220–222 refs (See N67-26714 14-04)

Presented is a review of historical and recent studies on the hematologic effects of increased oxygen tensions on humans and laboratory animals. It is concluded that although the bulk of data arising from both animal and human exposures to increased oxygen tensions is both incomplete and inconsistent, the analysis of available information suggests the following: (1) The erythrocyte is sensitive to small variations in oxygen tension in the blood and the foci of sensitivity to increased oxygen tension are in the cell membrane where unsaturated fatty acids are subject to peroxidation, and intracellularly, where the balance between aerobic and anaerobic metabolic pathways is altered and the activities and integrity of various enzyme systems in both pathways are possibly affected. (2) Hematopoiesis, specifically erythropoiesis, is probably depressed by increased oxygen tensions just as it is stimulated by decreased oxygen tensions. (3) When exposed continually to a space capsule environment of pure oxygen at 5 psi, the normal individual probably experiences a decrease in circulating red cell mass secondary to gradual hemolysis arising from the above cited mechanisms and occurring only after his antioxidant defenses are overcome. (4) When exposed to the markedly increased oxygen tensions of a hyperbaric chamber, an individual probably undergoes the same changes but at a relatively accelerated rate. (5) Leukocytosis, seen in most of the exposures cited, is probably a nonspecific stress response. S.C.W.

N67-26730# Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N. Mex.
PSYCHOPHARMACOLOGICAL EVALUATION OF PRIMATES EXPOSED TO 5 PSIA 100% OXYGEN ATMOSPHERE
Thomas L. Wolfle *In* AMRL Proc. of the 2d Ann. Conf. on Atmospheric Contamination in Confined Spaces Dec. 1966 p 223–235 refs (See N67-26714 14-04)

In view of the need for more information on performance changes which might be associated with a single gas environment,

at altitude, over a significant period of time; experiments were conducted on 12 mature subhuman primates to evaluate the effects on performance of breathing 100% oxygen at 5 psia for 90 days. Individual work chambers were specifically designed to fit into the Thomas Dome hypobaric chamber. Each work chamber provided adequate quarters for a small primate for an extended time period. In addition, each chamber was fitted with a psychomotor work panel and an automatic system for water ad libitum. The schedule was 15 minutes in duration, followed by a 45-minute rest period and consisted of the following three integrated tasks: (1) dual continuance avoidance; (2) auditory response time; and (3) visual response time. On the basis of experimental findings it is concluded that: (1) Subhuman primates do not exhibit performance changes of any serious consequence when exposed to 100% oxygen at 5 psia for three months. (2) Performance decrements which were detected were generally closely associated with loss of environmental control or apparatus malfunctioning. (3) Measures of auditory functioning can be made only when noise within the experimental situation is sufficiently low or masked to preclude interference with the signal to the subject. (4) Proper controls over the environment and experimental apparatus must be planned for and accomplished if the reliability and validity of performance measures is to be achieved. S.C.W.

N67-26731# Aerojet-General Corp., Dayton, Ohio.
COMPARATIVE TOXICITY STUDIES ON ANIMALS EXPOSED CONTINUOUSLY FOR PERIODS UP TO 90 DAYS TO NO_2, O_3, AND CCl_4 IN AMBIENT AIR VS. 5 PSIA 100% OXYGEN ATMOSPHERE
James D. MacEwen and Robert P. Geckler *In* AMRL Proc. of the 2d Ann. Conf. on Atmospheric Contamination in Confined Spaces Dec. 1966 p 238–259 refs (See N67-26714 14-04)

A study designed to evaluate the response of animals to toxic materials administered under conditions of reduced pressure and varying partial pressures of oxygen, is reported. Emphasized is the applicability of data gathered under these conditions to manned space flight programs, and their usefulness in the definition of contaminant tolerance levels and acceptable atmospheres for space cabins enduring prolonged flights. Beagle dogs, rhesus monkeys, mice, rats, and in one case, guinea pigs, were subjected to continuous exposure of threshold limit values (TLV) concentrations of nitrogen dioxide, ozone, and carbon tetrachloride for periods of 90 days in both 100% oxygen at 260 mm Hg and air at 720 to 740 mm Hg pressure. The following three factors were focused on in these experiments: oxygen atmosphere, reduced pressure, and continuous exposure. A review of two weeks experiments is also included. On the basis of data obtained, evidence is reasonably conclusive that, for the materials and conditions used in the experiments, the TLV for space cabin conditions may not be radically different from industrial TLV. Threshold limit values have classically included a large and sometime unknown safety factor. In view of the fact that some differences were found, there is indication that perhaps the safety factors of the TLV for the three materials studied were about to be exceeded. It is concluded that, it does not appear clear that the TLV for space applications may not be radically different from industrial TLV if only the factors of continuous dosage, reduced pressure, and pure oxygen atmosphere are considered. S.C.W.

N67-26732# Laboratory for Experimental Biology, St. Louis, Mo.
PATHOLOGICAL EFFECTS OF EXPOSURE TO PULMONARY IRRITANTS AT AMBIENT AIR VS. 5 PSIA 100% OXYGEN ATMOSPHERE FOR PERIODS UP TO 90 DAYS
R. L. Patrick *In* AMRL Proc. of the 2d Ann. Conf. on Atmospheric Contamination in Confined Spaces Dec. 1966 p 260–264 (See N67-26714 14-04)

Reported is a study designed to compare the toxic effects of contaminants under conditions of 5 psia (pounds per square inch, absolute) and 100% oxygen and normal atmospheric conditions. Mortality and pathologic alterations were evaluated in monkeys, rats, and dogs exposed continuously to various concentrations of nitrogen dioxide and ozone for 14 days. All three species exposed to two concentrations of NO_2 and ozone showed greater mortality at ambient conditions than at altitude. Animals dying early showed changes under both conditions. Survivors of each group showed similar changes except in isolated instances. Alveolar hemorrhage and edema were the most prominent changes associated with early death. It appears that 5 psia, 100% oxygen offered some degree of protection against alveolar hemorrhage and edema. In some groups inflammatory changes were more marked under altitude conditions; however, this is thought to reflect the longer survival of this group. S.C.W.

N67-26733# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson, AFB, Ohio.
COMPARATIVE PATHOLOGY OF ANIMALS EXPOSED TO CARBON TETRACHLORIDE AT AMBIENT AIR VS. 5 PSI 100% OXYGEN ATMOSPHERE
David T. Harper, Jr. and Farrel R. Robinson *In its* Proc. of the 2d Ann. Conf. on Atmospheric Contamination of Confined Spaces Dec. 1966 p 265–278 refs (See N67-26714 14-04)

Carbon tetrachloride was used as a contaminant in a series of 2 week animal exposures in atmospheres of 100% oxygen at 258 mm Hg (5 psia) and air at 700 mm Hg. Presented are results of comparative pathological studies of young male and female beagle dogs, *Macaca mulatta* monkeys, Wistar and SPF Sprague–Dawley rats, and male Harlan ICR mice. The implications of these studies are twofold. First, the effect of alterations of atmospheric composition on the toxic properties of this specific systemic agent may well be applicable to other possible contaminants in confined systems. Second, recent biochemical findings pertaining to carbon tetrachloride toxicity suggest that an atmosphere containing a high partial pressure of oxygen would exert a synergistic effect with this agent. In view of the fact that all species had high levels of sporadic, enzootic, and unrelated pathology, changes in the liver in each species and deaths among exposed mice were used as the basis for evaluating the effects of CCl_4 at altitude and ambient conditions. The most telling argument for an increased toxic effect of CCl_4 under altitude conditions was the great difference in mortality among mice exposed at the highest concentrations. All of the classic histologic signs of CCl_4 poisoning of the liver were observed. It is surmised that it is very likely that the basic biochemical mechanisms of both oxygen and CCl_4 toxicity are highly similar. The superimposition of the one stress on the other therefore would be expected to have an additive or synergistic effect, which is what was observed in these studies. S.C.W.

N67-26734# School of Aerospace Medicine, Brooks AFB, Tex.
RESUME OF MANNED EXPERIMENTS
Lexter J. Krasnogor and B. E. Welch *In* AMRL Proc. of the 2d Ann. Conf. on Atmospheric Contamination in Confined Spaces Dec. 1966 p 281–289 refs (See N67-26714 14-04)

Reviewed are studies conducted by the Environmental Systems Branch of the USAF School of Aerospace Medicine regarding the biomedical effects of potential space cabin environments. Discussed are studies pertinent to the issue of single versus mixed gas atmospheres for manned space flight. Atmospheric compositions studied consisted of either 100% oxygen; 70% oxygen and 30% helium; 44% oxygen and 56% helium; 40% oxygen and 60% nitrogen; and 33% oxygen and 67% nitrogen. Experiments were performed in two and four man space cabin simulators over a period of five years. All atmospheres tested were tolerated well enough so that the studies were all completed without major difficulties. Those studies involving oxygen at higher than normal alveolar tensions resulted in decreases in hematocrit which were not of enough magnitude to be a clinical problem over the span of

the experiments but could conceivably become serious in a more prolonged exposure. The presence of an inert gas has certain real and theoretical advantages over the single gas atmosphere. There were no detectable differences between nitrogen and helium that would favor either gas from a biomedical viewpoint. The need for reevaluation and further research regarding the correlation of findings in animals with those in humans is amplified. S.C.W.

N67-26735# Aerojet-General Corp., Dayton, Ohio.
EFFECT OF A MIXED GAS ATMOSPHERE AT 5 PSIA ON THE TOXICITY OF NO_2 AND O_3 IN ANIMALS
James D. MacEwen and James M. McNerney *In* AMRL Proc. of the 2d Ann. Conf. on Atmospheric Contamination in Confined Spaces Dec. 1966 p 290–314 refs (See N67-26714 14-04)

An experimental protocol, similar to that used previously for two week continuous exposures to the intermediate chamber concentrations of NO_2 and O_3 (38.8 and 8.0 mg/M^3, respectively), was designed to study the effect of a mixed gas environment on the toxicity of these gases. Nitrogen, rather than helium, was used as the inert part of the gas mixture. Studied were the effects of the mixed gaseous atmosphere on rats, dogs, and monkeys. The 14-day continuous exposure of laboratory animals to an ozone chamber concentration of 8.0 mg/M^3 in the mixed gas environment at 5 psia resulted in a mortality that was intermediate to previously reported studies. To verify the protective effect of oxygen against O_3 toxicity, an additional experiment was conducted at near ambient pressure air enriched with oxygen to produce a pO_2 of 260 mm Hg. Only dogs and monkeys were used. The mortality response was reduced to zero and no clinical symptoms of ozone toxicity were observed in the exposed animals. It is concluded that there is a reduction in toxicity of pulmonary irritants in a 5 psia 100% oxygen environment and that this protection is apparently the result of increased oxygen partial pressure. In ozone, the protective action of oxygen is clear cut and extends into the ambient pressure range. This may indicate the potential efficacy of oxygen therapy in ozone exposures. The evidence for the protective action of oxygen against NO_2 toxicity was not definite. S.C.W.

N67-26737# Naval Training Device Center, Port Washington, N. Y.
EFFECTS OF SIGNAL PATTERNING UPON VIGILANCE PERFORMANCE AND PHYSIOLOGICAL RESPONSES
John L. Andreassi and M. Stephen Huntley, Jr. Jan. 1967 36 p refs
(NAVTRADEVCEN-IH-62; AD-648948) CFSTI: HC $3.00/MF $0.65

The purpose of the investigation was twofold: (1) to determine the effect of signal patterning upon physiological responses and time to detect signals; (2) to study performance of subjects (Ss), with and without patterning, under conditions in which they were either informed or uninformed about the signal patterning. Vigilance performance and physiological responses with variable interval (VI) and fixed interval (FI) signal patterns were studied in four groups of Ss. Three of the four groups were required to make responses (telegraph key presses) in order to detect signals. Reaction time (RT) was used as the performance measure while heart rate (HR), palmar skin conductance (PSC) and galvanic skin responses (GSRs) were the physiological measures. Each S was tested in two separate one hour sessions on each of two days. The results indicated that there was a tendency for RTs to be faster under the FI schedule of signals than with the VI. The HR and PSC measures showed higher variability with the VI schedule while GSRs were more variable under the FI schedule. Faster RTs tended to be related to higher levels of HR, PSC and GSRs. It was suggested that: (1) faster RTs under the FI schedule reflected greater learning of the regular signal pattern; (2) faster RTs with higher degrees of physiological activation were due to greater numbers of sensory impulses which traveled cortically and had effect of improving alertness and readiness to respond. Several implications of these results for training are discussed. Author (TAB)

N67-26750# Stanford Univ., Calif. Biophysics Program.
INITIAL CONDITIONS, PHYSICAL LAWS, AND THE ORIGIN OF LIFE
H. H. Pattee Dec. 1966 15 p refs Presented at the Am. Phys. Soc. Winter Meeting, Stanford, Calif., Dec. 1966
(Contract Nonr-225(90); Grant NSF GB-4121)
(BL-186; AD-648738) CFSTI: HC $3.00/MF $0.65

The paper explores the meaning of the origin of life using the language of physics. It attempts to arrive at a physical theory of the origin of life and discusses some possible experimental approaches to see if the theory can be tested. Author (TAB)

N67-26755# Carnegie Inst. of Tech., Pittsburgh, Pa. Management Sciences Research Group.
TOWARD THE DESIGN OF A GROUP: A PRELIMINARY MODEL
M. W. Shelly and A. C. Stedry (Kans. Univ.) Jan. 1967 28 p refs
(Contracts Nonr-760(24); N00014-66-C0173)
(RR-88; AD-648084) CFSTI: HC $3.00/MF $0.65

Concepts relevant to a theory of group design are presented. Criteria appropriate to evaluating group interaction are developed. A simple model of interaction within a group is presented. Using a linear programming formulation, the value of group interaction is maximized. The emphasis throughout is on interaction value as a function of the subjects discussed, the knowledgability of the speakers and the interests of the listeners. This, rather than the amount of action per se, is the focus of the current work and future plans discussed for expanding the model. Author (TAB)

N67-26760# Tracerlab., Waltham, Mass.
ANALYSIS OF SELECTED SAMPLES BY MICROWAVE SPECTROSCOPY FOR TRACE CONTAMINANTS COLLECTED FROM A SPACE SIMULATOR Final Report, Jun. 1965–Feb. 1966
Joris M. Brinkerhoff and Stanley M. Klainer Jan. 1967 13 p refs
(Contract AF 41(609)-2809)
(SAM-TR-67-3; AD-648132) CFSTI: HC $3.00/MF $0.65

Analyses of simulator atmosphere samples were attempted using microwave spectroscopy. The samples were obtained directly from the simulator and were not subject to any further treatment before analysis was attempted. The results indicated absence of microwave absorbing gases in concentrations ranging from approximately 5 to 5000 p.p.m. with the exception of water vapor. The direct sample technic for microwave analysis of the trace contaminant concentration in simulator atmospheres appears unfeasible with present technics and instrumentation of microwave spectroscopy. Author (TAB)

N67-26761# California Univ., Berkeley. Lawrence Radiation Lab.
BIOLOGY AND MEDICINE Semiannual Report
John H. Lawrence, ed. 1966 157 p refs
(Contract W-7405-ENG-48)
(UCRL-16898) CFSTI: HC $3.00/MF $0.65

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N67-26762# California Univ., Berkeley. Lawrence Radiation Lab.
ENDOGENOUS PRODUCTION OF ^{14}CO: AN *IN VIVO* TECHNIQUE FOR THE STUDY OF HEME CATOBOLISM
Stephen A. Landaw and Saul Winchell *In its* Biol. and Med. 1966 p 1–10 refs (See N67-26761 14-04)

A method is presented for the separation, detection, and quantitation of endogenously produced carbon-14-labeled carbon monoxide in the rat, following injection of glycine-2-^{14}C. In this method, respiratory $^{14}CO_2$, the only significant breath contaminant, is removed with a sodalime absorber. The remaining breath activity, due primarily, if not entirely, to ^{14}CO, is oxidized to $^{14}CO_2$ by Hopcalite, absorbed in an ethanolamine-containing solution, and counted by liquid scintillation. Standard ^{14}CO and $^{14}CO_2$ gases, as well as animal experimentation, confirm this method's ability to measure ^{14}CO and $^{14}CO_2$ production rates simultaneously, following a single injection of labelled glycine. Examples are given to show that this continuous, in vivo, and easily performed method can give important information concerning heme catabolism. The technique should provide a unique source of information in the study of disease processes characterized by abnormal heme catabolism in man and other animals. Author (NSA)

N67-26763# California Univ., Berkeley. Lawrence Radiation Lab.
A SIGNIFICANT DIFFERENCE IN MAMMALIAN-CELL POLYPLOIDY INDUCTION BETWEEN PLATEAU AND "STAR" REGIONS OF A NEGATIVE PION BEAM
William D. Loughman, H. Saul Winchell, Mudundi R. Raju, and John H. Lawrence *In its* Biol. and Med. 1966 p 11–13 refs (See N67-26761 14-04)

A preliminary report showed that plateau and star (or peak) regions of negative pion beams differ in their capacity to induce polyploidy and other effects on mammalian cells in vivo. Results are reported from further work in which a statistically significant difference between the effects of the two beam regions was demonstrated. Mice with the A-2 lymphoma as an ascites tumor were irradiated in a negative pion beam from the 184-inch cyclotron. Mice in the plateau portion of the beam (about 60% pions) received an average dose of about 230 rads. Mice in the peak region of the beam (30 to 40% pions) received about 350 rads. On the third and fourth days following irradiation, ascites cells were removed from the mice and prepared for chromosome examination, and 4,000 metaphase cells from each mouse were scored as essentially diploid or as polyploid. In each case the incidence of polyploidy among irradiated cells was increased over control values. Significantly higher values were seen in cells irradiated in the beam's peak region than in cells irradiated in the plateau region. NSA

N67-26764# California Univ., Berkeley. Lawrence Radiation Lab.
BIOLOGICAL SPECIALIZATION IN MEGAKARYOCYTES AND PLATELETS
Jean-Michel Paulus *In its* Biol. and Med. 1966 p 14–21 refs (See N67-26761 14-04)

Data from recent studies on the biological specification in megakaryocytes and blood platelets are summarized. Data are included on the metabolic behavior of circulating platelets. NSA

N67-26765# California Univ., Berkeley. Lawrence Radiation Lab.
THE EFFECT OF ERYTHROPOIETIN ON THE GROWTH AND DEVELOPMENT OF SPLEEN COLONY-FORMING CELLS
John C. Schooley *In its* Biol. and Med. 1966 p 22–41 refs (See N67-26761 14-04)

The development of erythroid colonies in the spleens of lethally γ irradiated mice following bone marrow transplantation was suppressed by the production of polycythemia or the injection of antibody against erythropoietin into the host mice. The injection of exogenous erythropoietin into nonpolycythemic animals did not increase the number of spleen colonies produced by a bone-marrow transplant. The injection of exogenous erythropoietin into polycythemic host mice in some experiments did not significantly alter the number of colonies produced by a bone-marrow transplant, whereas in other experiments a marked increase in the number of spleen colonies occurred. The discrepancy between theee experiments is discussed. The overall doubling time of colony-forming cells in the spleens of polycythemic mice was not altered by the injection of exogenous erythropoietin during the first 10 days after bone marrow transplantation. Some evidence is presented suggesting that the doubling time of colony-forming cells in polycythemic mice receiving erythropoietin was maintained equal to that observed in polycythemic mice not receiving erythropoietin by some change in the proliferation of colony-forming cells. Arguments are presented suggesting that erythropoietin does not act on the colony-forming cell directly, but upon some erythropoietin-sensitive cell derived from the colony-forming cell. Author (NSA)

N67-26766# California Univ., Berkeley. Lawrence Radiation Lab.
INFLUENCE OF SEVERE HYPOXIA ON HUMAN ERYTHROPOIETIN
William E. Siri *In its* Biol. and Med. 1966 p 42–52 refs (See N67-26761 14-04)

The total volume of red blood cells in the healthy person is controlled by the production of red cells whose rate, according to prevailing evidence, is mediated by erythropoietin. Whether or not primary control of erythropoiesis normally is vested in blood oxygen tension is not certain. It is clear, however, that low oxygen tension stimulates erythropoiesis to maintain a compensatory increase in red-cell volume that is related, in an ill-defined way, to degree of hypoxia. The influence of hypoxia on the regulation of

red-cell volume was investigated in human subjects exposed to oxygen partial pressures ranging from 160 mm Hg (sea level) to 69 mm Hg (21,500 ft). Plasma–iron turnover, blood volume, and the ordinary hematological quantities were measured in Andean residents of 12,500 and 17,000 ft, and in climbers at sea level, at 17,800 ft, and at 21,500 ft, during an ascent of Mt. Everest. NSA

N67-26767# California Univ., Berkeley. Lawrence Radiation Lab.
STUDIES ON THE THYMUS AND THE RECIRCULATING LYMPHOCYTE POOL
John C. Schooley and Marvin M. Shrewsbury *In its* Biol. and Med. 1966 p 53–63 refs (See N67-26761 14-04)

The temporal relationships between thymectomy and the first indication of a depression in thoracic duct lymphocyte outputs was studied in rats. The effects of transplantation of thymic tissue on the thoracic duct lymphocyte output and the effect of altering the total recirculating lymphocyte pool, utilizing the technique of parabiosis, were also studied. NSA

N67-26768# California Univ., Berkeley. Lawrence Radiation Lab.
SERUM-LIPOPROTEIN DISTRIBUTION AND PROTEIN ANALYSIS BY REFRACTOMETRY
Frank T. Lindgren, Norman K. Freeman, Robert D. Wills, Alicia M. Ewing, and Lin C. Jensen *In its* Biol. and Med. 1966 p 64–71 refs (See N67-26761 14-04)

The use of refractometry for measurement of proteins in blood serum is discussed, with emphasis on the influence of lipoproteins on the accuracy of measurements of total proteins. A procedure is described for converting the measured refractive increment of each lipoprotein class to the appropriate value it would have in a serum background environment. Results are reported from measurements of mean values and standard deviations in serum proteins in nonfasting normal males and females using refractometry data or calculations by other formulae. Lipoproteins were isolated and measured either by refractometry or ultracentrifuge methods with corrections made by means of a computer program. The data indicate that neither total serum proteins nor total real protein can be measured accurately by serum refractometry unless the total content of serum lipoproteins is considered. Serum refractometry can be done on one drop of serum and the procedure has been partly automated. NSA

N67-26769# California Univ., Berkeley. Lawrence Radiation Lab.
STUDIES ON DEFICIENT MAMMALIAN CELLS ISOLATED FROM X-IRRADIATION CULTURES
Paul W. Todd *In its* Biol. and Med. 1966 p 72–81 refs (See N67-26761 14-04)

Colonies of deficient cells appear in X-irradiated cultures of human as well as hamster cells. High-LET radiation was more effective than x radiation in the production of deficient cells, by the criterion of small-colony development. Deficient cells were respiratory deficient only to the extent that they consumed less oxygen than normal cells. Hamster cells did not express their inherited deficiencies visibly in their karyotypes. This does not conclude, however, that heritable chromosome aberrations cannot result in cellular deficiencies of the type described. NSA

N67-26772# California Univ., Berkeley. Lawrence Radiation Lab.
THE INTERPRETATION OF MICROBIAL INACTIVATION AND RECOVERY PHENOMENA
Robert H. Haynes *In its* Biol. and Med. 1966 p 97–116 refs (See N67-26761 14-04)
(Grant PHS-GM-12667)

Reproductive death in bacteria treated with X-rays, ultraviolet light, or nitrogen mustard arises primarily from the formation of structural defects in DNA serving to block normal DNA replication. The apparent radiosensitivity of cells can be increased by altering either the physico-chemical reactions involved in the formation of the defects or by interfering with the biochemical repair processes. Sensitization by interference with repair appears to be involved in at least three well-known radiobiological effects: (a) the existence of shoulders on survival curves; (b) the synergistic interactions that occur among uv, X-rays, and nitrogen mustard; and radiosensitization by agents that either bind or are incorporated into DNA (e.g., acridine dyes and halogenated base analogs respectively). Since repair is an enzymic, energy-requiring process, it can be attenuated by excessive DNA substrate damage, by direct attack on the repair enzymes, or by blockage of its energy supply. In general, it is difficult to distinguish among these three alternatives. Repair of uv damage in *E. coli* B/r is a multistep process involving nuclease excision of defective single-strand segments containing pyrimidine dimers, and a non-conservative mode of DNA replication which fills in the resulting gaps. Similarities in the relative sensitivities of *E. coli* B/r, B and B_{s-1} to uv and nitrogen mustard, the involvement of nucleases in repair, and the observation of repair replication after both uv and nitrogen mustard treatment lend strong support to the idea that it is not the damaged bases themselves that are recognized by the repair enzymes, but rather the associated secondary structural alternations in the phosphodiester backbone. Author (NSA)

N67-26773# California Univ., Berkeley. Lawrence Radiation Lab.
INACTIVATION OF PHAGE α BY SINGLE-STRAND BREAKAGE
David Freifelder *In its* Biol. and Med. 1966 p 117–122 refs (See N67-26761 14-04)

Bacillus megaterium phage α is more sensitive to x irradiation than a typical phage of its size containing double-stranded DNA. Double-strand breakage accounts for only a small part of the inactivation in contrast with many other phages. An ultracentrifuge assay was used to measure single-strand breakage in the DNA of the x-irradiated phages. The inactivating event is apparently a single-strand break. However, not all single-strand breaks are lethal. Two alternatives are possible: (1) a break is lethal only if it occurs in a particular strand or (2) only one strand can function in the cell, and this strand is selected at random. These alternatives cannot be distinguished by the present experiments. Author (NSA)

N67-26774# California Univ., Berkeley. Lawrence Radiation Lab.
REPLICATION OF DNA DURING F'LAC TRANSFER
David Freifelder *In its* Biol. and Med. 1966 p 123–127 refs (See N67-26761 14-04)
(Grant PHS-C-M-12667)

F'Lac is a DNA-containing (1) episomal element, which can be transferred from a male donor strain of the bacterium *E. coli* to a female recipient by conjugation. The mechanism by which this transfer occurs is not known. Suggested models for transfer are of three types: those for which DNA synthesis is unnecessary, those for which DNA synthesis accompanies transfer, and those for which DNA synthesis precedes transfer. In most investigations, the nature of the DNA transferred under normal conditions of DNA synthesis has been examined. The nature of the transferred DNA was studied in another way. If a thymine-requiring male transfers F'Lac in a medium containing 5-bromouracil deoxyriboside (BUDR) instead of thymine, the presence of BUDR in the transferred DNA can be detected by virtue of its sensitization to the effects of short or long wavelength ultraviolet irradiation. DNA transferred without replication would be resolved as a fraction of F'Lac recipients relatively resistant to the irradiation. Experiments are described that show that, in agreement with the results of others, the transferred DNA has been replicated prior to or during transfer. Author (NSA)

N67-26775# California Univ., Berkeley. Lawrence Radiation Lab.
PLEIOTROPY AND POLYMORPHISM
Jack Lester King *In its* Biol. and Med. 1966 p 128–129 refs (See N67-26761 14-04)

Recent work in theoretical population genetics has demonstrated, principally through the use of computer simulation of Mendelian populations, that genetic polymorphisms can be maintained through interactions between various factors that do not singly effect polymorphic balance. Thus neither linkage alone nor stabilizing selection alone leads to stable genetic diversity, but together these factors can maintain a polymorphic equilibrium. The interactions of stabilizing selection and mutation in this respect, and the effects of triple interactions of linkage, epistasis, and inbreeding in the maintenance of genetic diversity are discussed. It is pointed out that multigenic systems cannot be dealt with by analyzing the isolated effect of any single variable. Other interacting variables must also be considered in turn: pleiotropy, temporal fluctuations in selection intensities, environmental clines, compensation, and more. It is suggested that pleiotropy is potentially a potent factor toward the maintenance of genetic diversity. A simple model demonstrating this in the interaction of pleiotropy and stabilizing selection is presented. NSA

N67-26776# California Univ., Berkeley. Lawrence Radiation Lab.
INCREASE IN PLASMA GROWTH-HORMONE LEVEL IN THE MONKEY FOLLOWING THE ADMINISTRATION OF SHEEP HYPOTHALMIC EXTRACTS
Joseph F. Garcia and Irving I. Geschwind *In its* Biol. and Med. 1966 p 130–136 refs (See N67-26761 14-04)
(Grant PHS-HD-00394)

Results are reported from a study on the effects of intravenously injected sheep hypothalmic extracts on the content of pituitary growth hormone in the blood plasma of monkeys (*Macaca mulatta*). It was concluded that the observations reported support the concept that the secretion of anterior pituitary growth hormone is mediated by a hypothalmic neurohumoral factor. NSA

N67-26810# Naval Research Lab., Washington, D. C.
THE APPLICATION OF MAN-MACHINE SYSTEM EQUALIZATION TECHNIQUES IN THE DESIGN OF HEAD-UP DISPLAY Final Report
C. L. Tipton Jan. 1967 70 p refs
(NRL-MR-1740; AD-648301) CFSTI: HC $3.00/MF $0.65

A two-symbol head-up display design incorporating an optimal form of system equalizing feedback dynamics is conceived as feasible and adequate for the consistently accurate manual control of stereotyped flight profiles. The design provides a compound control symbol for the simultaneous display of stick, throttle and rudder commands. A general systems analysis (longitudinal plane) illustrates the utilization of this display design in the landing, take-off and weapon delivery modes of flight. The feasibility of this design concept is substantiated by the development of an analytical methodology which directly determines an optimal configuration of system equalizing feedback terms for a given higher order control loop. These feedback signals drive the operator's displayed control symbol such as to elicit manual control motions that effect an optimal system response in the cancellation of system error. This equalization methodology is exemplified in the determination of a full complement of implemented feedback terms for the optimal pitch control of a high performance fixed wing aircraft. General observations are made concerning the inclusion and influence of a human operator in an equalized control loop. Author (TAB)

N67-26876# School of Aerospace Medicine, Brooks, AFB, Tex.
PHYSIOLOGIC BASELINE STUDIES OF ZOOLOGIC SPECIMENS. PHYSIOLOGIC VALUES OF THE NORMAL IMMATURE CHIMPANZEE UNDER RESTRAINT
Bobby L. Caraway Dec. 1966 37 p refs
(SAM-TR-66-100; AD-648128) CFSTI: HC $3.00/MF $0.65

The effects of 24-hour restraint on normal physiologic values were studied in a group of eight young chimpanzees. Hourly recordings were made of body temperature, respiration rate, pulse rate, and blood pressure. Urine was collected by an indwelling catheter in increments of 6 hours to determine specific gravity, 24-hour volume, and biochemical assays for creatinine, sodium, potassium, 17-ketosteroids, 17-hydroxycorticosteroids, and total catecholamines. Four blood samples were taken: (1) at hour 0 beginning restraint, (2) at the 24th hour which ended restraint, (3) at hour 48, and (4) at hour 192. The effects of restraint plotted over an eight-day period depict fluctuations in the hematogram and serum biochemical values. An effort was made to correlate anxiety during restraint with variations in physiologic values. Most of the parameters under study did fluctuate during restraint and subsequently returned to baseline after release from restraint. Author (TAB)

N67-26895# School of Aerospace Medicine, Brooks AFB, Tex.
AN INITIAL INVESTIGATION OF THE EFFECTS OF PULSED IONIZING RADIATION ON THE PRIMATE EQUILIBRIUM FUNCTION
Donald J. Barnes Dec. 1966 19 p refs
(SAM-TR-66-106; AD-648671) CFSTI: HC $3.00/MF $0.65

A Primate Equilibrium Platform (PEP) was designed and constructed in order to ascertain the effects of pulsed ionizing radiation on the equilibrium function. Twelve rhesus monkeys were trained to maintain a platform-horizontal position by the manipulation of a joy stick. The experimental animals were transported to the Fast Burst Reactor (FBR) at White Sands Missile Range (WSMR), N. Mex., and were irradiated at that facility. The animals received an average midhead dose of 2,420 rads delivered in a microsecond pulse. Following irradiation, each animal was tested for 1 hour. The primary dependent variables were: (1) the time per trial spent on horizontal, and (2) the number of errors (deviations from horizontal) per trial. Results demonstrated a significant, though transient, early performance decrement. All experimental animals included in the final analysis demonstrated a recovery phenomenon subsequent to the early performance decrement. The results confirmed the equilibrium function to be relatively radiosensitive and worthy of further investigation. A modified PEP is projected for future experiments in order to more completely define the parameters of the radiation environment with respect to the equilibrium function. Author (TAB)

N67-26901# School of Aerospace Medicine, Brooks AFB, Tex.
AN ANALYSIS OF REPEATED MEASUREMENTS ON EXPERIMENTAL UNITS IN A TWO-WAY CLASSIFICATION, 1959–1966
Richard C. McNee (M.S. Thesis—Va. Polytech. Inst.) Oct. 1966 39 p refs Submitted for publication
(SAM-TR-66-86; AD-648381) CFSTI: HC $3.00/MF $0.65

In experiments with repeated measurements made on the same subjects, the repeated observations in time may be correlated. The assumption of independent observations, therefore, cannot be made in general. The paper considers the experimental design with treatments in a two-way classification with a disproportionate number of subjects allocated to each treatment combination and repeated measurements made on the subjects. A procedure is shown to be applicable for computing an analysis under somewhat restrictive assumptions. It is assumed that the variances are equal for all times and the correlations in time are equal. The tests obtained are for the three-factor interaction, the two-factor interactions assuming the three-factor interaction zero, and the main effects assuming all interactions zero. The procedure requires the inverse of one matrix, some matrix multiplication, and the calculation of some standard sums of squares. Author (TAB)

N67-26912# RAND Corp., Santa Monica, Calif.
SOME ASPECTS OF MAN–COMPUTER COMMUNICATION IN ACTIVE MONITORING OF AUTOMATED CHECKOUT
Leonard Chesler and Rein Turn Mar. 1967 34 p refs Presented at the 4th Space Cong., Cocoa Beach, Fla., 3–6 Apr. 1967
(P-3522; AD-648553) CFSTI: HC $3.00/MF $0.65

Requirements for active participation by test personnel in monitoring automated checkout operations arise whenever hazardous conditions exist, tight time schedules must be met, and costs of failure are high. Under these circumstances the goals of a human monitor could be to maintain context with the progress of the checkout operations and to detect and react to malfunctions in checkout equipment, incorrect design or execution of the checkout programs, and unexpected events that the latter have not been designed to handle. The human monitors effectiveness in performing these tasks depends directly on what information is available to him and how it is presented. Displays that use simple coding and formating to increase information extractability and that contain adequate anticipatory and alerting information may be essential for real-time interaction with automated checkout operations. As an example of extractable information presentation, a dynamic network display of checkout operations is discussed. Such a display permits a monitor to determine at a glance the status of the checkout process. The programming task for the display can be greatly eased by use of a digital computer equipped with graphic input devices.
Author (TAB)

N67-26921# School of Aerospace Medicine, Brooks AFB, Tex.
PROCEEDINGS OF THE THIRTEENTH ANNUAL CONFERENCE OF AIR FORCE BEHAVIORAL SCIENTISTS
Charles L. Jennings and Carlos J. G. Perry, ed. Sep. 1966 421 p refs Conf. held at Lackland AFB, Tex., 12–14 Jan. 1966
(AD-648168) CFSTI: HC $3.00/MF $0.65

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12. ON MODIFYING BEHAVIOR: REFLECTIONS ON THE THERAPEUTIC PROCESS R. E. McKenzie (Federal Aviation Agency) p 233–243 (See N67-26930 14-04)

13. AIR FORCE PSYCHIATRY—1966 (THE BINDS THAT TIE) L. G. Nuernberger p 283–294 refs (See N67-26931 14-04)

14. SUITABILITY OF AF ROTC GRADUATES FOR FLYING ASSIGNMENTS: AN AREA OF POTENTIAL INVOLVEMENT FOR UNIVERSITY MENTAL HYGIENE CLINICS C. J. G. Perry p 295–303 refs (See N67-26932 14-04)

15. TREATMENT OF A PHOBIA BY BEHAVIOR MODIFICATION T. P. Pritchett (Air Force Hospital) p 304–308 (See N67-26933 14-04)

16. AN ADVANCED LIFE-SUPPORT CAPSULE FOR THE CHIMPANZEE M. Reite, L. Stephens, and O. Lewis (Aerospace Med. Div. Aeromedical Res. Lab.) p 309–327 refs (See N67-26934 14-05)

N67-26922# School of Aerospace Medicine, Brooks AFB, Tex.
BEHAVIORAL RESPONSE OF PRIMATES TO PULSED GAMMA–NEUTRON RADIATION
Donald J. Barnes *In its* Proc. of the 13th Ann. Conf. of Air Force Behavioral Scientists Sep. 1966 p 45–53 refs (See N67-26921 14-04)

Outlined is a behavioral response experiment on primates which will test their equilibrium function before and after exposure to pulsed ionizing gamma and neutron radiation. Rhesus monkeys, seated on a rotational device which rotates in two major axes, will be taught to control the pitch and roll of the platform with a stick. After the animal is trained to balance the platform sufficiently long, he will be irradiated and his subsequent behavior will be observed for any changes from the norm. G.G.

N67-26923# Air Force Hospital, Forbes AFB, Kan.
SHORT-TERM GROUP TREATMENT OF LATE-ADOLESCENT AIRMEN
Allen W. Davis *In* School of Aerospace Med. Proc. of the 13th Ann. Conf. of Air Force Behavioral Scientists Sep. 1966 p 87–94 refs (See N67-26921 14-04)

Group treatment for late-adolescent airmen was organized in order to help them to get along in their personal lives and on their jobs. Through group interaction they learned a mutual responsibility of helping each other with their problems, to achieve new growth and maturity in interrelating with other people, and to improve their ability to perform their jobs. Group therapy was halted after 12 meetings because the men were getting along so well that the supervisors wanted to terminate the treatment situation.
G.G.

N67-26924# Vanderbilt Univ., Nashville, Tenn.
USE OF AMPHETAMINES BY INDIVIDUALS IN CRITICAL OCCUPATIONS
John D. Griffith *In* School of Aerospace Med. Proc. of the 13th Ann. Conf. of Air Force Behavioral Scientists Sep. 1966 p 142–148 (See N67-26921 14-04)

Considered are special problems related to the use of amphetamines in the United States Air Force as stimulant or psychotomimetic. Amphetamines are frequently prescribed for wartime and combat stress situations, emotional states associated with sudden and frequent transfer, disruption of family coherence, financial anxieties, and long waits for promotion. It seems that except for the first few days, amphetamines are little better than a placebo in the treatment of depressions. Important hazards in amphetamine treatment are drug-dependency and psychosis with abrupt states of frenzy and agitation. Military physicians should consider the possibility of drug-use in patients who are: (1) severely agitated or who have anxiety reactions; (2) individuals who seek amphetamines for weight reduction but do not seem to lose weight; (3) patients demonstrating abrupt personality changes; (4) patients with schizophrenic symptoms that clear up rapidly; and (5) when treating alcoholism. G.G.

N67-26925# Air Force Personnel and Training Research Center, Randolph AFB, Tex.
UNITED STATES AIR FORCE CHAP PROGRAM
Byron Hacker *In* School of Aerospace Med. Proc. of the 13th Ann. Conf. of Air Force Behavioral Scientists Sep. 1966 p 149–155 (See N67-26921 14-04)

The existing Air Force Handicapped Children Program is outlined to provide assistance for eligible military personnel who have unmarried children emotionally disturbed or physically or mentally handicapped and incapable of self-support. The possibility of humanitarian reassignment is pointed out, as well as additional allowance authorizations to help defray the extraordinary expenses incurred by families with handicapped children. G.G.

N67-26926# Air Force Hospital, Sheppard AFB, Tex.
MENTAL ILLNESS AMONG WOMEN IN THE AIR FORCE
David A. Halperin *In* School of Aerospace Med. Proc. of the 13th Ann. Conf. of Air Force Behavioral Scientists Sep. 1966 p 156–163 (See N67-26926 14-04)

Mental illness among WAFs seems to be treated differently from the way it is treated in other branches of the US Air Force, in that a higher degree of administrative flexibility is accorded commanders, and subsequent psychiatric hospitalization of WAFs is more usually indicative of severe pathology. Finally, being a WAF may well be a step toward health for the individual and given the more flexible administrative framework of the WAF, a step that the military psychiatrist can well respect. Author

N67-26927# Air Force Hospital, March AFB, Calif.
ON PSYCHIATRIC TESTIMONY
Warren Higgins *In* School of Aerospace Med. Proc. of the 13th Ann. Conf. of Air Force Behavioral Scientists Sep. 1966 p 164–180 refs (See N67-26921 14-04)

The author advocates that the military judge refer an offender for psychiatric evaluation in cases where there is no doubt that the accused performed the offense, but where there is a reason to suspect that mental or emotional factors played a significant role. The examining psychiatrist's report should include all relevant material obtained and relating to the understanding of the individual and his offense. Any significant mental or emotional condition present should be presented to the offense. The psychiatrist should also render an opinion as to whether the individual is rehabilitable or deterrable in the military setting, and include a recommendation for further medical treatment or discharge. G.G.

N67-26928# School of Aerospace Medicine, Brooks AFB, Tex.
THE HEWSON RATIOS REVISITED VIA THE WAIS
Charles L. Jennings *In its* Proc. of the 13th Ann. Conf. of Air Force Behavioral Scientists Sep. 1966 p 181–194 refs (See N67-26921 14-04)

Hewson ratios of psychological effects in head injuries were determined for subjects of the following diagnostic categories: (1) normal functioning personnel; (2) personnel with psychiatric problems; (3) rated officers with old head injuries; and (4) personnel hospitalized with head injuries. Results showed that approximately a third of each, the normal and neurotic groups, were identified as being organic; for the neurotic group only 7% were correctly identified. It was concluded that the Hewson ratios as originally defined contributed little to the differentiation and diagnosis of cerebral pathology, and that age was a significant factor for the normal group when compared with the other three groups ($P < .001$). G.G.

N67-26929# Air Force Hospital, Lackland AFB, Tex.
PRIVILEGED COMMUNICATION AND THE BEHAVIORAL SCIENTIST
John P. McGinty *In* School of Aerospace Med. Proc. of the 13th Ann. Conf. of Air Force Behavioral Scientists Sep. 1966 p 220–232 refs (See N67-26921 14-04)

In order to keep privileged communications between social workers and clients confidential, a certification or registration seems to be necessary. Four states in the United States have officially certified social workers, but only one state has extended the privileged communication protection. To advocate certification in all states seems to be unwise since such licensing jeopardizes the standing and positions of untrained social workers. G.G.

N67-26930# Federal Aviation Agency, Atlantic City, N. J.
ON MODIFYING BEHAVIOR: REFLECTIONS ON THE THERAPEUTIC PROCESS
Richard E. McKenzie *In* School of Aerospace Med. Proc. of the 13th Ann. Conf. of Air Force Behavioral Scientists Sep. 1966 p 233–243 (See N67-26921 14-04)

For behavioral change to occur in humans, there must be recognition of an unsatisfactory present adjustment and a desire to effect a corresponding change. All therapies must provide a therapeutic atmosphere and a framework for the basic components of the patient's behavior. The patient provides the building blocks from which the structure of his personality and its behavioral components are formed. G.G.

N67-26931# Air Force Hospital, Lackland AFB, Tex.
AIR FORCE PSYCHIATRY—1966 (THE BINDS THAT TIE)
Louis G. Nuernberger *In* School of Aerospace Med. Proc. of the 13th Ann. Conf. of Air Force Behavioral Scientists Sep. 1966 p 283–294 refs (See N67-26921 14-04)

Projected are the various aspects of the psychiatrist's role in military life and the obvious difficulties he encounters in a closed, authoritarian system. This system where orders are issued from above and guidance is solicited from below has the disadvantage that, unless the right questions are asked from above downward, vital information may not proceed from below upward. As professional staff advisor the psychiatrist is obliged to provide information and guidance at all levels of command and to communicate effectively. G.G.

N67-26932# School of Aerospace Medicine, Brooks AFB, Tex.
SUITABILITY OF AF ROTC GRADUATES FOR FLYING ASSIGNMENTS: AN AREA OF POTENTIAL INVOLVEMENT FOR UNIVERSITY MENTAL HYGIENE CLINICS
Carlos J. G. Perry *In its* Proc. of the 13th Ann. Conf. of Air Force Behavioral Scientists Sep. 1966 p 295–303 refs (See N67-26921 14-04)

A review of referral cases from the consultation service at the School of Aerospace Medicine showed psychiatric considerations to be more prevalent among ROTC graduates in the lieutenant group. This finding should be checked against sources of data outside the school. In the meantime, it may be a worthwhile venture to reappraise factors of motivation among students currently in ROTC training. Although it may be most difficult to approach, an appraisal of the policies of individual ROTC units could provide further insight into what I have described as an apparent problem. Author

N67-26933# Air Force Hospital, Travis AFB, Calif.
TREATMENT OF A PHOBIA BY BEHAVIOR MODIFICATION
Thomas P. Pritchett *In* School of Aerospace Med. Proc. of the 13th Ann. Conf. of Air Force Behavioral Scientists Sep. 1966 p 304–308 (See N67-26921 14-04)

Described is the clinical therapeutic treatment of a phobia against open-field situations and large rooms by deep-relaxation

of the subject. During the hypnotic-like trance, the patient was ordered to think of the most pleasant thought and to describe it. Fond memories and phantasy figures were abruptly terminated when the patient felt anxious in accordance with the extinction portion of the planned treatment procedure. In the course of seven sessions a complete symptom-free situation was obtained and the patient was able to engage in all forms of former fear-arousing situations. G.G.

N67-26934# Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N. Mex.

AN ADVANCED LIFE-SUPPORT CAPSULE FOR THE CHIMPANZEE

Martin Reite, Loyd Stephens, and Oliver Lewis *In* School of Aerospace Med. Proc. of the 13th Ann. Conf. of Air Force Behavioral Scientists Sep. 1966 p 309-327 refs (See N67-26921 14-04)

Reported are the test results on an advanced life-support capsule for a chimpanzee. Information obtained from the EEG, behavioral, and physiological monitoring during an 8 day period showed that performance impairment and EEG abnormalities occurred prior to any abnormalities in other physiological measures; progressive behavioral impairment was clearly reflected in cortical EEG changes. G.G.

N67-26937# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

TOXIC EFFECT OF HIGH OXYGEN PRESSURES ON THE ANIMAL ORGANISM

I. M. Ivanov and B. D. Kravchinskiy 20 Sep. 1966 24 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR (Moscow), v. 17, no. 5, 1934 p 1019-1034

(FTD-TT-65-940; AD-646498) CFSTI: HC $3.00/MF $0.65

Blood transfusion from an animal subjected to compressed oxygen and showing a series of convulsive seizures did not produce an oxygen poisoning syndrome in the recipient in the small doses employed. At high oxygen pressures an increase in blood sugar is observed which is associated with an intensified muscular activity during the seizures. Thus, the hypothesis of a hypoglycemic character of the convulsions in oxygen poisoning must be discarded. In decerebrated animals (in which the thalamus opticus has not been removed) convulsive seizures in oxygen poisoning are not observed even at 8 atm. of oxygen. It is concluded that the site of damage of the central nervous system causing the convulsions in oxygen poisoning is the cerebral cortex. Preliminary hedonal anesthesia eliminates convulsive seizures in oxygen poisoning. The anesthesia must be sufficiently deep for this purpose. With a short exposure, the anesthesia produces a favorable outcome. Although the use of hedonal eliminates the seizures, it does not warrant an appreciable extension of the exposure, since a sufficiently prolonged action of compressed oxygen will inevitably produce acute inflammatory manifestations in the lungs causing death. In all cases, hedonal post-anesthesia stops seizures observed after removal from the chamber. However, the outcome of the oxygen poisoning depends on the magnitude of oxygen pressure and on the exposure, the species, and the individual resistance of the experimental animal. At 8 atm. pressure, the outcome is unfavorable, since the seizures recur after prolonged sleep and result in death. Author (TAB)

N67-26944# Santa Rita Technology, Inc., Menlo Park, Calif.

RED-WINGED BLACKBIRD RESPONSES TO ACOUSTIC STIMULI

Gordon W. Boudreau Feb. 1967 36 p

(Contract F44620-67-C-0042)

(AFOSR-67-0717; AD-648967) CFSTI: HC $3.00/MF $0.65

A three-month study conducted at Moody Air Force Base, Georgia, revealed that Red-Winged Blackbirds in flight were sensitive to the compressor whine produced by jet engines on the T-37 training aircraft. Response to T-37 sounds was manifested by determined and often spectacular efforts to evade or avoid the sound field. Synthesized versions of the T-37 sounds with carrier frequencies ranging from 2500-3500 hertz, amplitude modulated by frequencies of 75-150 hertz, were more effective than the natural T-37 sounds. No inurement to T-37 sounds developed in the birds. The blackbirds failed to respond consistently to other acoustic stimuli, including other aircraft and their own natural alarm sounds, while in flight. However, natural alarm sounds were effective when projected to blackbirds feeding in fields or perched in trees. Unrelated species present failed to respond to T-37 sounds. Tests using acoustic barrier concepts were successful in re-routing the blackbirds normal flight patterns and the results suggest this may be feasible in alleviating the bird strike hazard at Moody Air Force Base. Author (TAB)

N67-26947# Human Factors Research, Inc., Santa Barbara, Calif.

THE OBJECTIVE IDENTIFICATION TEST: A STRESS-SENSITIVE PERCEPTUAL TEST Technical Report

William Harris Feb. 1967 31 p refs

(Contract Nonr-3135(00))

(TR-209-1; AD-648999) CFSTI: HC $3.00/MF $0.65

The purpose of this study was to develop additional items for the Object Identification Test (OIT), a test designed to measure some effects of environmental stress on human perceptual performance. Each item of the OIT consists of an ordered series of seven line drawings: the first drawing in a series presents a relatively ambiguous stimulus; details are added to successive drawings until, in the last drawing, an easily recognizable common object is pictured. The subject responds to each drawing of an item; his score is the drawing number on which he correctly identifies the object. Performance on the OIT involves central perceptual processes, and it is assumed that stress affects those processes. There is evidence that performance on the OIT is affected by at least three kinds of stress: intense noise exposure, noxious stimulation of test-related stimuli, and extended close confinement. Author (TAB)

N67-26966# Illinois Univ., Urbana. Group Effectiveness Research Lab.

INTERPERSONAL PERCEPTION AND PSYCHOLOGICAL ADJUSTMENT OF GROUP MEMBERS Annual Report

Fred E. Fiedler Mar. 1967 20p refs

(Contract DA-49-193-MD-2060)

(AD-648741) CFSTI: HC $3.00/MF $0.65

This project investigates factors in the work situation which contribute to the personal adjustment and effective performance of military personnel. The projects particular concern is with the influence of the work group and the task situation on individual performance and adjustment. The project aims to develop principles and methods which will enable the military services to prevent and alleviate maladjustment by capitalizing on existing interpersonal relations in groups or by structuring the group and the task situation so as to promote these adjustive interpersonal relations. TAB

N67-26970# System Development Corp., Santa Monica, Calif.

FOUNDATIONS OF A THEORY OF NEURAL MECHANISMS

Leonard Friedman 20 Jan. 1967 12 p refs

(SDC-SP-2702/000/00; AD-648753) CFSTI: HC $3.00/MF $0.65

The paper explains the underlying principles of a model of functional neural mechanisms that produce instinctive behavior. Two strong predictions of the theory are explained. One prediction is the existence of a functional unit or cell that can be replicated over and over again to produce a larger hierarchical organization of a behavior producing mechanism, very much as cells are joined to produce an organism. The second prediction is the existence of

an extensive repertoire of neural units to produce and control units of motor behavior so that all movements of the organism are combinations of activated units selected from this repertoire. Evidence for this second prediction is cited from experiments on monkeys. Author (TAB)

N67-26972# Ohio State Univ., Research Foundation, Columbus.
VISUAL EFFECT OF HIGH INTENSITY FLASHES Quarterly Report, 15 May–15 Aug. 1966
Norma D. Miller 23 Aug. 1966 26 p
(Contract AF 41(609)-3078)
(Rept.-1; QR-1; AD-647339) CFSTI: HC $3.00/MF $0.65

Two main areas of investigation are the reciprocity between intensity and duration for flashes shorter than one millisecond; (The current study utilizes double flashes of 250 msec duration with intervals between the flashes varying from zero to 1 msec.) and the luminosity function for 45 monochromatic test flashes in the presence of 10-degree white light adapting fields of various luminances. TAB

N67-27004# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
ANALYTICAL GAS DESORPTION APPARATUS Final Report, Jul. 1964–Mar. 1965
W. H. Toliver, Sr., R. E. Bennett, and C. G. Roach Nov. 1966 17 p refs
(AMRL-TR-65-61; AD-648516) CFSTI: HC $3.00/MF $0.65

Volatile organic contaminants are a problem in spacecraft, evaluators, and other closed cabin atmospheres and must constantly be measured. Consequently, a chemical high vacuum system for the desorption and manipulation of desorbates from solid adsorbents was developed. Essentially, the system is provided with three provisions for trapping the contaminant depending on its volatility. The high boilers are trapped in the first section, the compounds with low vapor pressure are collected in the middle section, and the noncondensables in the third section of the apparatus. Author (TAB)

N67-27008# School of Aerospace Medicine, Brooks AFB, Tex.
EFFECTS OF IONIZING RADIATION ON THE CONCENTRATION OF AMINO COMPOUNDS IN RAT PLASMA Technical Report, Jun. 1965–Jun. 1966
Charles E. Craft and Jack A. Winstead Jan. 1967 11 p refs
(SAM-TR-67-8; AD-648223) CFSTI: HC $3.00/MF $0.65

The concentrations of 28 different amino compounds were measured in the plasma of normal and irradiated rats. Preliminary results have indicated a 50% decrease in the concentration of the amino compounds during the first 24 hours, and an additional decrease was measured in the 48-hour postirradiated animals. There were two amino acids, lysine and serine, that showed the greatest decrease in concentration after radiation exposure. This preliminary study clearly indicated significant changes in the concentration of amino compounds in blood plasma after exposure to ionizing radiation. Author (TAB)

N67-27014# Army Engineer Geodesy, Intelligence and Mapping Research and Development Agency, Fort Belvoir, Va.
VISUAL FACTORS AFFECTING THE PRECISION OF COORDINATE MEASUREMENT IN AEROTRIANGULATION
Desmond C. O'Connor 13 Jan. 1967 186 p refs
(GIMRADA-RN-21; AD-648303) CFSTI: HC $3.00/MF $0.65

A study was made of the precision of centering black circular measuring marks in sharp circular targets simulating artificial pass-points with homogeneous backgrounds of different densities. An extensive review of the relevant functions of the visual system is given, and the task is related to the general area of visual acuity. The results demonstrate that the precision of pointing may be significantly affected by the size relationship between the measuring mark and pass-point, the background density, and the adaptation level, provided that the instruments used are sufficiently sensitive. The results support the proposition that subjective neural effects at edges contain significant visual information, and this would appear to be important where visual settings are being made by bringing geometrical configurations into close relationship with one another. The maximum information for the centering was contained in ribbons approximately 1 minute of arc wide around the light areas of target and measuring mark. The most precise pointings were made by selecting a measuring mark to give a minimum annulus width within these ribbons, irrespective of the target size, up to 2 degrees retinal subtense. The relationship between the standard deviation of pointing and annulus width appears to be linear for annulus widths up to approximately 1 minute of arc visual subtense. A discontinuity occurs in this vicinity, and the relationship appears to take on an exponential form. Author (TAB)

N67-27017# School of Aerospace Medicine, Brooks AFB, Tex.
TOXICOLOGY OF BORON HYDRIDES—STUDIES OF ALTERATIONS IN TISSUE AMINES BY TOXIC DECABORANE-14($B_{10}H_{14}$) AND PENTABORANE-9(B_5H_9) AS MODIFIED BY HYDRAZINES AND PROPYNYLAMINES Technical Report, Oct. 1963–Mar. 1966
Arthur A. Wykes and Juanita H. Landez Dec. 1966 17 p refs
(SAM-TR-66-112; AD-648537) CFSTI: HC $3.00/MF $0.65

Investigations of the influence of the toxic boron hydrides, decaborane-14 and pentaborane-9, on biogenic amine metabolism were undertaken to assist in the elucidation of the toxic mechanisms and sites of action of boron hydrides in animals. Brain and heart tissue serotonin and norepinephrine were found to be significantly depleted after treatment of test subjects with the boron hydrides. The testing of a number of potential antidotes for the treatment of the toxic symptoms and biogenic amine changes due to exposures to boron hydrides has resulted in the discovery of several new antidotal drugs for the toxic effects of decaborane-14. Pargyline (N-methyl-N-benzyl-2-propynylamine), a potent nonhydrazide monoamine oxidase (MAO) inhibitor, provides protection against the depletion of rat brain and heart norepinephrine, as well as the reserpine-like sedation and ataxia observed in decaborane-intoxicated rats. In contrast, several close analogs of pargyline do not protect against the depletion of tissue norepinephrine due to decaborane poisoning. JB-516 (1-phenyl-2-hydrazinopropane), a potent hydrazine-related MAO inhibitor, greatly potentiates the toxic effects of decaborane-14, as does iproniazid (1-isonicotinyl-2-isopropylhydrazine). Doses of the B6-vitamin pyridoxine also appear to counteract the toxic effects of decaborane-14. Monoamine oxidase inhibition and elevation of tissue amines per se by a drug do not appear to be required properties for the drug to decrease or eliminate the toxic actions of boron hydrides. Followup studies, which include investigations of the mode of action of pargyline and pyridoxine as protective agents in boron hydride-intoxicated animals, are in progress. Author (TAB)

N67-27043# Naval School of Aviation Medicine, Pensacola, Fla. Aerospace Medical Inst.
MORALE LEVEL AS A FUNCTION OF THE SUBJECT'S OWN DEFINITION OF MORALE
Rosalie K. Ambler and Everett R. Burnett 21 Nov. 1966 13 p refs
(NAMI-984; AD-648875) CFSTI: HC $3.00/MF $0.65

It was hypothesized that morale level as measured by a self-rating scale would vary as a function of the subjects own definition of morale. During the week of their graduation from training, 560 Naval aviation trainees were administered an anonymous questionnaire that, among other things, asked them to give their own definition of morale. They were then instructed to note the morale of their own group in advanced training on a

ten-point scale with their own definition as a frame of reference. A content analysis of the definitions was made, and three definition areas were identified. These can be described briefly as task oriented, group oriented, and feeling oriented. Mean morale rates were obtained for the subjects falling in each of the definition categories. Significant differences among this array of means were demonstrated. The task oriented group yielded the highest mean, with group oriented and feeling oriented following in that order. Hypotheses for further study were developed. Author (TAB)

N67-27057# Clark (David) Co., Inc., Worcester, Mass.
RESEARCH AND DEVELOPMENT OF EXTRAVEHICULAR PROTECTIVE ASSEMBLY Final Technical Report, 2 Jul. 1962–30 Apr. 1964
Norman H. Osborne and Lee C. Rock (AMRL) Oct. 1966 73 p refs
(Contract AF 33(657)-9532)
(AMRL-TR-66-143; AD-647197) CFSTI: HC $3.00/MF $0.65

A prototype extravehicular pressure suit assembly was designed and fabricated for use in earth and lunar environments. Conditions of space environment, preliminary design concepts, laboratory evaluations of materials, the intermediate model configuration, and the final suit assembly are described in detail. This assembly consists of special underwear, linear ventilation system, gas container, restraint layer and cover, insulation, micrometeorite protection, and outer reflective layer, and a life support system. The life support system is a liquid oxygen, semiclosed, recirculating-type backpack. The use of new material distinguishes this assembly from current pressure suits. Recommendations for further research and development are included. Author (TAB)

N67-27077# Texas Christian Univ., Fort Worth. Inst. of Behavioral Research.
DIMENSIONS OF STIMULUS SITUATIONS WHICH ACCOUNT FOR BEHAVIOR VARIANCE Annual Progress Report
S. B. Sells 31 Dec. 1966 7 p refs
(Contract Nonr-3436(00))
(AD-647466) CFSTI: HC $3.00/MF $0.65

The general objectives of the studies undertaken center around the identification, isolation, and quantification of situational variables that account for substantial variance in behavior. The main thesis of the investigation is that behavior variance is a function of three universes of variables: (A) Individual differences (represented by measures of aptitude, interest, attitude, and personality), (B) Situational or environmental variables, (C) The interaction of individual differences and situational (environmental) variables, and that psychology has neglected the systematic study of the environment. The tasks discussed in this report involve: (A) Studies of dimensions of groups, (B) Stress reviews, (C) Exploration of variables descriptive of the environment, and (D) A survey of military psychologists' job satisfactions, based on a 20 per cent sample of membership of the American Psychological Association. Author (TAB)

N67-27102*# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
LINGUISTICS
In its Res. Lab. of Electron. 15 Apr. 1967 p 279–303 refs
(See N67-27081 14-23)
(Contracts AF 19(628)-2487; DA-28-043-AMC-02536(E); Grants NSF GK-835; NIG G-MH-04737-06)

Communication science and engineering research in the field of linguistics is reported. Language concepts are discussed in the following areas: noncyclic transformational grammars, Lithuanian morphophonemics, English inward-and-upward directionals, and the concept of performance. R.Ll.

N67-27104*# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
NEUROPHYSIOLOGY
In its Res. Lab. of Electron. 15 Apr. 1967 p 321–327 refs
(See N67-27081 14-23)
(Contracts NSR-22-009-138; AF 33(615)-3885; Grant NIH NB-04985-04)

Neurophysiological research is reported on contrast detectors, and the problem of insight into neuronal closed loops from shift-register theory. Consideration is given to the dependence of ganglion tone upon the length of the contrast, or edge, of the retinal image and upon its velocity. By applying a process used to model a specific visual ganglion cell, an expression is obtained for such a dependence. This process is the lateral (nonlinear) inhibition at the level of the ganglion cell dendrites. Within the scope of nerve net theory, concepts of shift registers have been formulated. Technical details are completed by a logic gate schematic of a nonlinear feedback shift register for control and command. R.Ll.

N67-27189# Federal Aviation Agency, Atlantic City, N. J. Test and Evaluation Div.
HUMAN FACTORS EVALUATION OF A LARGE SCREEN RADAR DISPLAY Final Report
Lee E. Paul and Edward P. Buckley Mar. 1967 31 p refs
(RD-66-105)

A Controller Decision Evaluation (CODE) experiment was performed to compare a 20-inch horizontal individual display with an 8 by 10 foot Eidophor projected group display in the terminal environment. Sixteen subjects used each display for four 90-minute sessions. No significant differences between displays were found in either the number of conflictions missed or the number of unnecessary control actions taken. It was concluded that there is nothing inherent in the large common display that would preclude it from use as an air traffic control display. A discussion of a number of factors should be considered in such a use is given. Author

N67-27202 Joint Publications Research Service, Washington, D. C.
ANTICHOLINE ESTERASE PROPERTIES O-H-ALKYL–S-BUTYL METHYL THIOPHOSPHANATES
A. A. Abduvakhabov, N. N. Godovikov, M. I. Kabachnik, S. S. Mikhaylov, V. I. Rozengart et al 10 Apr. 1967 7 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 171, no. 4, 1966 p 857–859
(JPRS-40572; TT-67-31216) CFSTI: $3.00

To determine the extent to which the anticholinesterase action O,S-dialkyl methyl thiophosphonate will change with the changing length of alkoxyl groupings, an analysis was conducted on O-H-alkyl-S-H-butyl methyl thiophosphonates. The value of bimolecular constant speeds of inhibiting cholinesterase was used to judge this anticholinesterase activity. The results show that the maximum anticholinesterase of the two series of combinations examined corresponds to the equal length of the alkoxylic and alkthyolic groups. This may indicate indirectly that the sorption of alkoxylic and alkthyolic groupings takes place in the same section of the ferment surface. M.G.J.

N67-27207 Joint Publications Research Service, Washington, D. C.
PSYCHOLOGY OF SETS AND CYBERNETICS
I. T. Bzhalava 4 Apr. 1967 6ℓ p Transl into ENGLISH from the book "Psikhologiya Ustanovki i Kibernetiki" Moscow, Nauka, 1966 p 1–250
(JPRS-40522; TT-67-31166) CFST .00

A review is presented on a monograph which analyzes the set concept in relation its interdisciplinary nature and its

use as a logical basis for the theory of the functional organization of the brain. The experimental–theoretical investigation also attempts to connect the theory of sets with modern views about the organization of action, and the basic principles of cybernetics. The table of contents is listed, and the chapter on "Neurophysiological Bases of the Set" is reprinted. This discusses the connection of the image with the conditioning signal; the image as a signal for actuating the set; the motoric set concept; tentative reflex and the set; hierarchic states of sets; and the adaptation concept. M.G.J.

N67-27208 Joint Publications Research Service, Washington, D. C.

USE OF THE ELECTRON MICROSCOPE TECHNIQUE IN ONCOGENIC VIROLOGY

Janusz Groniowski 5 Apr. 1967 10 p refs Transl. into ENGLISH from Postepy Hig. Med. Doswiadczalnej (Warsaw), Jan.–Feb. 1965 p 77–82 Presented at the Warsaw Conf. on Oncogenic Viruses, Warsaw, 4 Apr. 1963

(JPRS-40538; TT-67-31182) CFSTI: $3.00

Summary information is presented on the use of electron microscope techniques in such research projects as (1) the ultrastructure of tumor viruses based on material purified and separated from its cell; (2) the relationship of the virus to the host cell, including penetration of the virus into the cell, localization in the cell, multiplication, and ultrastructural deviations in the host cell due to the influence of the virus; and (3) explorations in the tumorous cell of ultrastructures responding to infection with the virus. Limitations of the techniques are discussed, and it is pointed out that the method provides little data on the influence of the virus in the oncogenic process. M.G.J.

N67-27233*# Ling-Temco-Vought, Inc., Dallas, Tex. Astronautics Div.

PERFORMANCE AND THERMAL RESPONSE OF THE GEMINI EXTRAVEHICULAR SPACE SUIT—EXPERIMENT I-b

R. O. Pearson, T. E. Mouritsen, and F. H. Goodnight 23 Dec. 1964 231 p

(Contract NAS9-3414)

(NASA-CR-65617; Rept.-00.573) CFSTI: HC $3.00/MF $0.65 CSCL 06K

Main objective of the test series was to determine the design adequacy for operation in an extravehicular earth orbit. The prototype suit was instrumented for temperature and pressure measurements and was tested in a simulated 200-nautical-mile earth orbit. A thermal dummy capable of providing the sensible heat of a man was placed into the suit assembly. Testing was conducted over a three-day period under the following conditions: (1) cold soak with −320°F walls; (2) earth orbit simulation; (3) contact with heated spacecraft surface; and (4) high solar heat inputs. Specific measurements, simulation methods, and construction of the suit are described. Suit pressures ranged from 3.8 to 4.4 psia, gas leakage varied between 140 and 190 scc/min. The temperature of the outer surface of the suit did not exceed +200°F or fall below −200°F during the tests. Test performance of the suit was in general within acceptable limits. K.W.

N67-27266*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

AN EXPERIMENTAL INVESTIGATION OF TWO VISUAL METHODS OF ALTITUDE DETERMINATION

Jacob H. Lichtenstein and William T. Suit Washington, NASA, May 1967 30 p refs

(NASA-TM-X-1392) CFSTI: HC $3.00/MF $0.65 CSCL 05H

An investigation was made to measure the ability of an astronaut to determine the altitude of his spacecraft above the lunar surface by purely visual means. Two techniques were used: one consisted of matching calibrated curved arcs to the projected horizon curvature, and the other consisted of measuring the visual arc subtended by a known surface feature. The slides used for projection were photographs of a relief map of the lunar surface A second set of slides with a smooth arc for the horizon was used in order to evaluate the effect of horizon irregularity. For the limited field of view used (about 40°) in the horizon-arc matching technique, the average errors for these measurements were as large as 36 miles (58 km) and the standard deviation was about 28 miles (45 km). Repeating the slides a second time or using the smooth-arc slides decreased the error but did not seriously affect the standard deviation. The results indicate that a learning process is involved and that features on the horizon do influence the altitude estimations. The surface-feature technique, when the surface feature was viewed from directly above, seemed to be considerably more accurate for determining altitude than the horizon-matching technique. Author

N67-27298*# National Aeronautics and Space Administration, Washington, D. C.

AEROSPACE MEDICINE AND BIOLOGY—A CONTINUING BIBLIOGRAPHY WITH INDEXES

Apr. 1967 78 p refs

(NASA-SP-7011(36)) CFSTI: HC $3.00/MF $0.65 CSCL 06S

Abstracts are presented of current literature dealing with the biological, physiological, psychological, and environmental effects related to simulated and actual flights in the earth's atmosphere or in interplanetary space. References to similar effects in lower forms of life are included, as are other topics related to the aerospace medicine and biology field. The latter includes studies in sanitation, safety and survival, pharmacology and toxicology, life support systems, exobiology, and personnel factors of interest to space flight researchers. Both a subject index and an author index are included for these references, which were previously announced in publications of NASA, the American Institute of Aeronautics and Astronautics, and the Aerospace Medicine and Biology Bibliography Project of the Library of Congress. M.W.R.

N67-27315*# National Aeronautics and Space Administration, Washington, D. C.

SYNTHESIS OF MEDIATORS OF THE SYMPATHETIC NERVOUS SYSTEM AND PIGMENTATION IN THE ONTOGENESIS OF VERTEBRATES [SINTEZ MEDIATOROV SIMPATICHESKOY NERVNOY SISTEMY I PIGMENTOOBRAZOVANIYE V ONTOGENEZE POZVONOCHNYKH ZHIVOTNYKH]

N. A. Smitten May 1967 14 p refs Transl. into ENGLISH from Zh. Obshch. Biol. (Moscow), v. 25, no. 1, 1964 p 51–61

(NASA-TT-F-10952) CSCL 06C

Morphological peculiarities of the catecholamine synthesis in the course of differentiation of chromaffin cells of vertebrates (mammalians, birds, and amphibia) are discussed. The formation time of chemically active adrenergic substances is shown to be similar to the time of the development of embryonic motor responses indicated in the literature. The interdependence of the synthesis of adrenergic substances and the pigment formation is proved by means of cell calculation and quantitative determination of catecholamines in chromaffin cells in animals with different degree of pigmentation (white and black rats). The facts observed are explained by a common development of melanin-forming and chromaffin cells as well as by the products of their activity. Author

N67-27355# Joint Publications Research Service, Washington, D. C.

BIONIC ASPECTS OF MEASUREMENT AND CONTROL OF ODORS

V. N. Okhotskaya 4 May 1967 8 p refs Transl. into ENGLISH from Avtometriya (Novosibirsk), no. 6, 1966 p 104–108
(JPRS-40900; TT-67-31542) CFSTI: HC $3.00/MF $0.65

Olfactory receptors with specific sensitivity to certain odors are discussed, and a set of n-dimensional characteristics for the evaluation of the quality of an odor is suggested. Based on electrophysiological and psychophysical experiments, expressions are presented for the quantity, quality, and mixing of aromas. It is pointed out that the intensity may change the quality of the odor, and that two odors may produce a third. It is suggested that adsorption transducers might be used in construction of a multisensor device for objective evaluation of the quality and concentration of material vapors in the air. N.E.N.

N67-27356# Joint Publications Research Service, Washington, D. C.

PREVENTION AND TREATMENT OF CAISSON DISEASE

N. N. Shchupakov 22 Mar. 1967 162 p refs Transl. into ENGLISH of the book "Profilaktika I Lecheniye Kessonnoy Bolezni" Moscow, 1962 187 p
(JPRS-40325; TT-67-30970) CFSTI: HC $3.00/MF $0.65

The problems of the etiology and pathogenesis of caisson disease are discussed, and the essential instructions concerning treatment of caisson lesions are given. Measures for prevention of the disease and for the organization of medical sanitation service in connection with caisson operations are emphasized. Data are published on the prevention of the disease by the method of breathing oxygen during decompression. Problems connected with saturation and desaturation of the organism are discussed in detail. The publication is intended to familiarize medical personnel on caisson construction sites with the particularities of labor safety and with those preventive measures which make it possible to substantially reduce incidence among workers. Only the basic preventive measures are examined, and only the recommendations for treating caisson disease which have been most fully verified are presented. Author

N67-27357# Joint Publications Research Service, Washington, D. C.

PHYSIOLOGICAL MEASUREMENTS DURING SPACE TRAVEL

R. M. Bayevskiy 24 Mar. 1967 11 p Transl. into ENGLISH from Priroda (Moscow), no. 1, Jan. 1967 p 68–72
(JPRS-40381; TT-67-31026) CFSTI: HC $3.00/MF $0.65

The instrumentation and methods used to acquire physiological measurements are reviewed, emphasizing cardiological studies on the spacecrafts Vostok and Voskhod. Seismo-cardiographic tracings, pulse rate analysis, and variation of cardiac cycles and rate of heart contractions during weightlessness are outlined. The adaptation phases of the blood circulation system are described, and the alterations in motoractivity during writing are mentioned. Problem areas are identified as being a possibility of too many electrodes over the astronaut's body for greater mensuration and information, and the transmission of a sufficient volume of medical data over telemetering channels. The principal aspects to be applied for physiological mensurations during flights of long duration are indicated. N.E.N.

N67-27358# Joint Publications Research Service, Washington, D. C.

MEDICAL SERVICES AND FACILITIES ON BOARD SPACE CRAFT

R. M. Bayevskiy 24 Mar. 1967 43 p Transl. into ENGLISH of "Sluzhba Zdorov'ya V. Kosmose" (Moscow), no. 15, 1966 p 1–43
(JPRS-40383; TT-67-31028) CFSTI: HC $3.00

Consideration is given to the various aspects of space medicine, including biotelemetry systems, the role of a physician on a space flight, spaceborne diagnostic machines, the relation between space medicine and clinical medicine, and the prevention of diseases in space. The need for more detailed information on the functioning of biological systems is stressed, as well as reactions to various conditions. The transmission and processing of physiological telemetry data are discussed, and details are given on a system of medical supervision by means of on-board computer equipment. L.E.W.

N67-27360# Joint Publications Research Service, Washington, D. C.

OPTIMAL TRAINING ALGORITHMS FOR AUTOMATIC SYSTEMS IN THE CASE OF A NONIDEAL TEACHER

V. S. Pugachev 17 Apr. 1967 8 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 172, no. 5, 1967 p 1039–1402
(JPRS-40659; TT-67-31303) CFSTI: HC $3.00

Using the Bayes approach, formulas are developed for the posteriori probability density of the random vector and the optimal estimates of the decision function with respect to the criterion of least mean square error. The nonideal training conditions are identified as those in which it is impossible to put into the system absolutely accurate values of the required output signal, and only statistical estimates are used. The formulas define the general Bayes optimal training algorithm for an automatic system which does not depend on how the information input to the system is used in the training process. N.E.N.

N67-27373*# Nuclear Science and Engineering Corp., Pittsburgh, Pa.

STUDIES OF RADIOACTIVITY AND HYDROTHERMAL PROCESSES IN PROTOBIOCHEMISTRY ON EARTH AND THE MOON

R. L. Bogner, S. L. Hood, S. M. Somani, V. R. Zink, and E. R. White Mar. 1967 53 p refs
(Contract NASw-1508)
(NASA-CR-84414; NSEC-131) CFSTI: HC $3.00/MF $0.65 CSCL 06A

Studies have been performed that are related to abiogenic synthesis of protobiochemicals in a hydrothermal model system under the influence of ionizing radiation. A successful demonstration of the abiogenic formation of sulfur-containing organic compounds including sulfur amino-acids as well as a number of non-sulfur organic compounds was made. The model system concept envisions chemical abiogenesis proceeding on the primitive Earth in hot aqueous environments subjected to ionizing radiation. It is proposed that similar propitious geochemical events and conditions on the Moon and Mars, similar to those operative early in the history of the Earth, may be conductive to the formation of extraterrestrial organic compounds at the present time. Author

N67-27381# Library of Congress, Washington, D. C. Aerospace Technology Div.

CHANGES IN THE TIGROID SUBSTANCE OF NEURONS UNDER THE EFFECT OF RADIO WAVES [ZMINY TYGROYIDNOYI RECHOVYNY NEYRONIV PID VPLYVOM RADIOKHVYL]

V. S. Bilokrynyts'kyy 25 Jan. 1967 17 p refs Transl. into ENGLISH from Fiziol. Zh. (Moscow), v. 12, no. 1, 1966 p 70–78
(ATD-67-3) CFSTI: HC $3.00/MF $0.65

Changes in the tigroid substance and in other components of nerve cells in the cerebrum and spinal cord of cats subjected to a superhigh-frequency field, were studied. Neuron groups situated in the anterior, lateral, and posterior corners of the spinal cord; neurons in the cerebral hemispheres (motion, sensory, and other sections); neurons of subcortical formations and of the brain stem; cortical neurons; neurons of the nuclei of the cerebellum; and neurons of some intervertebral ganglions were investigated according to the outlined experimental procedure. Observations of the changes

found from the experiments are discussed; and comparisons with observations reported in the literature are made. L.S.

N67-27387# Joint Publications Research Service, Washington, D. C.
PHYSIOLOGY OF WORK IN SPACE
L. S. Khachatur'yants 24 Mar. 1967 11 p Transl. into ENGLISH from Med. Sestra (Moscow), no. 1, Jan. 1967
(JPRS-40399; TT-67-31044) CFSTI: HC$3.00

An account of physiological and emotional reactions occurring in the cosmonauts during their performance of tasks on the Voskhod-2 space flight is presented. Respiration and cardiac contraction rate data obtained throughout the flight are graphically depicted; and changes corresponding to various task events are noted. L.S.

N67-27390# Joint Publications Research Service, Washington, D. C.
IMAGE RECOGNITION
V. S. Fayn 1 May 1967 16 p Transl. into ENGLISH from Priroda (Moscow), no. 2, Feb. 1966 p 18–26
(JPRS-40835; TT-67-31478) CFSTI: HC$3.00/MF$0.65

A mathematical technique by which images may be recognized by sets of points based on approximation functions, whose graphs in space constitute families of lines is described. The equations of these functions also express the regularities in the sets of points generated by the images, and thus express the regularities in the set of images themselves. Practical applications of the technique (reading machines, oscillograms of word sounds, etc.) are discussed. L.S.

N67-27391 Joint Publications Research Service Washington, D. C.
METHOD OF PROGRAMMED PHYSIOLOGICAL MEASUREMENTS AND EXPERIENCE OF ITS USE ON THE "VOSKHOD" SPACESHIP
R. M. Bayevskiy and D. G. Maksimov 1 Mar. 1967 22 p refs Transl. into ENGLISH from Kosmich. Issled. (Moscow), v. 4, no. 5, 1966 p 768–780
(JPRS-40075; TT-67-30722) CFSTI: $3.00

The authors describe the general principles of a method for programmed physiological measurements during space flight, and the stages of its laboratory development. Several variants of the research programs are given. Special attention is given to the work capacity of cosmonauts. The results of programmed investigations during the flight of the Voskhod ship are given. Author

N67-27394# Joint Publications Research Service, Washington, D. C.
SOME CARDIOVASCULAR AND RESPIRATORY REACTIONS OF THE CREWMEN DURING THE VOSKHOD-2 ORBITAL FLIGHT
I. I. Kas'yan, P. V. Vasil'yev, D. G. Maksimov, I. T. Akulinichev, A. Ye. Uglov et al 8 Mar. 1967 19 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (Moscow), no. 1, 2, Jan.–Feb. 1967 p 104–115
(JPRS-40179; TT-67-30825) CFSTI: HC$3.00

Electrocardiographic, pulse and respirations rate, body temperature, and seismocardiographic data concerning the condition of the cardiovascular and respiratory systems of the astronauts P.I. Belyayev and A.A. Leonov during their flight in the spaceship Voskhod-2, are summarized. The data are also depicted by curves. No severe changes in the state of the basic functional system of the organism, and no noticeable reduction of the level of their performance of work were indicated. Belyayev manifested a more pronounced reaction of the cardiovascular and respiratory systems during the second orbital turn (when the second pilot entered the lock) and during the 17th orbital turn (when Belyayev performed manual control of the spaceship). Leonov showed a more pronounced reaction during the period of free floating in space and at the moment of his return aboard the ship (2nd orbit). These changes were predominantly connected with the emotional tension during performance of the most important tasks of the flight program. L.S.

N67-27435*# Naval School of Aviation Medicine, Pensacola, Fla.
FACTORS CONTRIBUTING TO THE BALLISTOCARDIOGRAPHIC WAVE FORM IN HEALTHY MIDDLE AGED MALES
David H. Jackson, Albert Oberman, Robert E. Mitchell, and Ashton Graybiel May 1966 41 p refs
(NASA Order R-136)
(NASA-CR-84436; NAMI-966) CFSTI: HC $3.00/MF $0.65 CSCL 06N

The availability of a large number of variables derived from clinical and laboratory evaluations of 200 middle aged males made it possible to relate them statistically to the BCG waves. Numerous significant correlations were found and these are discussed. It appears that, until the factors and their interrelationships are more precisely evaluated, the strictly quantitative use of BCG standards derived from groups to determine such things as stroke volume, among others, must be regarded with caution. The results seem to indicate that serial BCG's will be necessary for complete evaluation of an individual's cardiovascular status. Author

N67-27436*# Naval School of Aviation Medicine, Pensacola, Fla.
VECTORCARDIOGRAPHIC CHANGES DURING INTRACORONARY INJECTIONS
Raphael F. Smith, J. Warren Harthorne, and Charles A. Sanders 13 Feb. 1967 30 p refs
(NASA Order T-23237)
(NASA-CR-84435; NAMI-995) CSCL 06P

To determine mechanisms of myocardial toxicity of radiopaque media and to correlate specifically induced changes in the composition of coronary artery blood with the changes in the surface electrocardiogram simultaneous recordings were made from Frank leads X, Y, and Z during intracoronary injections of radiopaque media and special test solutions in 19 patients. It is concluded that the resulting T wave changes were caused by regional prolongation of the repolarization process, presumably due to extracellular sodium excess or sodium–calcium antagonism. Delay of the repolarization process and the resulting potential difference may be responsible for reentrant excitation and the ventricular arrhythmias observed during coronary angiography. Author

N67-27507 Kansas State Univ., Manhattan. Dept. of Psychology.
ANALYTIC STUDIES IN THE LEARNING AND MEMORY OF SKILLED PERFORMANCE Semiannual Report, Oct. 1, 1966–Mar. 31, 1967
Merrill E. Noble and Don A. Trumbo 24 Apr. 1967 18 p
(Grant NsG-606)
(NASA-CR-84473) CFSTI: HC$3.00 CSCL 05J

Several pilot studies and a completed study involving dual motor tasks are described. Previous experiments involving a primary tracking task and a secondary verbal task had indicated intertask interference in the dual task situations which appeared to be a function of the decision making requirements of the second task when an overt verbal response was required. The present studies were conducted to determine whether the same generalizations about human dual task performance would hold when the second task was another motor, and to evaluate the effects of the temporal phasing of the inputs from the two tasks on the degree of primary task interference. The results indicate that the response

requirements of the secondary task were a significant source of variance in tracking performance scores, but that no significant effects could be attributed to the phase relations between the two tasks. Another study is described which compares response strategies when the higher of two probabilities was the same in two alternative situations. Some partial results are discussed. R.N.A.

N67-27541# Occupational Health Research and Training Facility, Cincinnati, Ohio.
SENSIBLE AND LATENT HEAT LOSSES FROM OCCUPANTS OF SURVIVAL SHELTERS Final Report
Clark M. Humphrerys, Austin Henschel, and Douglas H. K. Lee Washington, Public Health Serv., Dec. 1966 33 p refs
(Contract OCD-P5-64-126)
(AD-648467) CFSTI: HC $3.00/MF $0.65

Six figures have been prepared showing the sensible and latent heat exchange rates from clothed and nude individuals at various environmental conditions and at three metabolic rates. Data are also included by which the heat exchange rates for the standard individual may be corrected for non-standard groups. Author (TAB)

N67-27558# Beaver Coll., Glenside, Pa.
LEADERSHIP STATUS AS A MODULATOR OF THE DETERMINATION OF SOCIAL INTERACTION BY PRIOR REINFORCEMENT
Bernard Mausner, Ellen Lederman, and Shirley Katz 1966 31 p refs
(Contract Nonr(G)-00028-66)
(TR-2; AD-648449) CFSTI: HC $3.00/MF $0.65

An experiment was designed to test the influence of prior experience of campus leadership as a modulating factor in the effect of prior reinforcement of judgmental responses on behavior in a social interaction in judgment. Twenty female college students were run; ten were leaders and ten were non-leaders. Judgments were made of the rate of alternation of a flickering light. Half of each group were told they were right 17 out of 21 trials; half of each group were told they were wrong on an equivalent number of trials. Ss were then run in apparent communication with each other, actually receiving false information that Ps judgments were 25 per cent higher. Among the leaders the reinforcement schedule determined tendency to shift judgments towards P; Ss told they were wrong shifted and those told they were right maintained. Among the non-leaders there was no demonstrable effect from the reinforcement schedule. However, the degree to which the experiment was perceived as a test of individual skills or as a social situation did determine degree of shift in judgment. Interaction effects on analysis of variance were significant for leader vs. non-leaders, positive vs. negative reinforcement. Thus, leaders are found to respond to cues in the outside world, non-leaders to internal mediating systems. Author (TAB)

N67-27571*# Atlantic Research Corp., Alexandria, Va.
ENVIRONMENTAL TESTING OF CONTAMINANT PRODUCING MATERIALS FROM THE INTEGRATED LIFE SUPPORT SYSTEM
W. S. Hodgkiss, Richard H. Johns, and James S. Swinehart Washington, NASA, Jun. 1967 103 p
(Contract NAS1-4425)
(NASA-CR-794) CFSTI: HC $3.00 CSCL 06K

An experimental investigation has been made of the existing and potential airborne trace contamination composition within the Integrated Life Support Systems (ILSS) test chamber located at Langley Research Center. Selected materials from the ILSS were examined as probable sources of contamination under specific time and temperature conditions to determine their characteristic products of gaseous evolvement. Contaminated air samples were collected as both "whole air" samples and cryogenically trapped samples. Primary compound identifications were made by gas chromatography with verification by mass spectrometry and infrared spectrophotometry. Physical and chemical changes in the materials due to heat effects were examined by weight changes and differential thermal analyses. Author

N67-27611*# Scientific Translation Service, La Canada, Calif.
PAPERS OF THE DVL-INSTITUTE FOR AERO-MEDICINE PRESENTED AT THE SIXTH INTERNATIONAL AND TWELFTH EUROPEAN CONGRESS OF AVIATION AND SPACE MEDICINE IN ROME, 1963 AND AT THE THIRTEENTH INTERNATIONAL CONGRESS OF AVIATION AND SPACE MEDICINE IN DUBLIN, 1964 [VORTRAEGE AUS DEM INSTITUT FUER FLUGMEDIZIN GEHALTEN AUF DEM VI. INTERNATIONALEN UND XII. EUROPAEISCHEN KONGRESS FUER LUFT- UND RAUMFAHRTMEDIZIN IN ROM 1963 UND DEM XIII. INTERNATIONALEN KONGRESS FUER LUFT- UND RAUMFAHRTMEDIZIN IN DUBLIN 1964]
W. Briegleb Washington, NASA, Jun. 1967 29 p refs Transl. into ENGLISH of DLR-FB-65-40, 1965
(Contract NASw-1496)
(NASA-TT-F-10957) CFSTI: $3.00 CSCL 06S

Aeromedicine subjects discussed are: therapy against decompression sickness, adaption to an unspecific stress, the mechanism of the serous stress reaction, the biochemical primary effects in radiation damage, clinical picture of the shifted diurnal rhythm during jet flights, explosion and decompression injuries, the influence of weightlessness in cell functions. Author

N67-27626*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
SELECTED STUDIES IN EXOBIOLOGY, PLANETARY ENVIRONMENTS, AND PROBLEMS RELATED TO THE ORIGIN OF LIFE Semiannual Progress Report, 1 Oct. 1966–31 Mar. 1967
Carl Sagan May 1967 8 p refs
(Grant NGR-09-015-023)
(NASA-CR-84461; SAPR-3) CFSTI: HC $3.00/MF $0.65 CSCL 06C

Theoretical work centered on: the development of a wind-blown dust model of Martian seasonal and secular changes, the contribution of protons from solar wind to Martian atmosphere ionization, calculations of temperature distributions on airless planets, and improved green house models of planetary atmospheres. Observational work covered the successful testing and new data collection with a planetary camera at the temperature distributions on airless planets, and improved green house models of planetary atmospheres. Observational work covered the successful testing and new data collection with a planetary camera at the 82-inch reflecting telescope of Mercury, Venus, Mars, and Jupiter, as well as UBV photography; attempts to detect elevation differences on Mars from CO_2 absorption lines were unsuccessful. Laboratory work consisted in completion of a combined distillation system and gas handling apparatus with pressure capabilities of 10^{-6} mm mercury; the system employs a magnetic piston and continuously dissolves synthesized gases in liquid water while avoiding boiling. G.G.

N67-27674*# IIT Research Inst., Chicago, Ill.
LIFE IN EXTRATERRESTRIAL ENVIRONMENTS Quarterly Status Report, Feb. 15–May 31, 1967
May 1967 40 p
(Contract NASr-22)
(NASA-CR-84516; IITRI-L6023-9) CFSTI: HC $3.00/MF $0.65 CSCL 06M

Soil ecology experiments on microorganism growth response in different soils were completed. Factors related to an organism's growth and survival probability in soil which, in turn, is related to the probability of extraterrestrial contamination, were studied as well as available moisture and a constant or daily fluctuating freeze-thaw incubation temperature. Brunizemic, desertic, and podzolic soils provided substrates with different pH's, organic content, soluble cations, and clay content. The brunizemic soil provided the best substrate for the growth and survival of *Bacillus cereus, Lactobacillus plantarum, Pseudomonas aeruginosa, Staphylococcus aereus,* and *Streptomyces albus. L. plantarum, S. aereus,* and *S. albus* grew in the podzolic soil, while *B. cereus,* Putrefactive Anaerobe (PA 3679), and *S. albus* survived in the desert soil. The daily freeze-thaw cycles enhanced the growth and survival of *S. aereus* and *L. plantarum* in the brunizemic and podzolic soils. The growth responses of organisms in the podzolic soil were about 1 log lower than their growth in brunizemic soil. R.N.A.

N67-27678*# Cedars of Lebanon Hospital, Los Angeles, Calif. Inst. of Medical Research.

A TECHNIQUE FOR TESTING HEART FUNCTION BY ANALYSIS OF ITS VIBRATION SPECTRUM Progress Report, 31 Dec. 1966–31 Jun. 1967

Clarence M. Agress Jun. 1967 4 p

(Grant NsG-289)

(NASA-CR-84512) CSCL 06P

A previously described method for indirectly determining stroke volume by isovolumetric contraction and ejection periods was extended to a new series of human subjects. In this current study the vibrocardiogram was used to measure the cardiac intervals and the dye dilution technique used to measure cardiac output in 10 normal subjects and 11 patients recovering from acute myocardial infarction. The correlation between the vibrocardiographic method and the dye output was highly significant ($r = 0.90$), substantiating our previous observations. A preliminary design of an analog computer model of the left heart was made to test the cardiac interval—stroke volume correlation on a theoretical basis. Author

N67-27679*# Cedars of Lebanon Hospital, Los Angeles, Calif.

MEASUREMENT OF STROKE VOLUME BY THE VIBROCARDIOGRAM

Clarence M. Agress, Stanley Wegner, Robert D. Fremont, Izumi Mori, and Dixie J. Day [1967] 25 p refs

(Grant NsG-289)

(NASA-CR-84513) CSCL 06P

An examination was made of the relationship between stroke volume measured by dye dilution and left ventricular isovolumetric contraction and ejection times as measured by the vibrocardiogram. These studies were performed in 10 normal subjects under postural alterations, and in 11 patients recovering from acute myocardial infarction. Regression analyses of the data showed that ejection time was highly correlated with stroke volume ($r = 0.84$), while use of both ejection time and isovolumetric contraction time improved correlation to $r = 0.90$. Similar correlations were obtained comparing changes in stroke volume with changes in the intervals. It was concluded that the VbCg provides a simple, non-traumatic method for the estimation of stroke volume. Author

N67-27698# Institute for Perception RVO–TNO, Soesterberg (Netherlands).

THE ELECTRORETINOGRAPHIC RESPONSE TO WEAK STIMULI OF LARGE SUBTENSE II

N. M. J. Schweitzer and P. Padmos [1966] 27 p refs

(IZF-1967-5; TDCK-47865) CFSTI: HC $3.00/MF $0.65

Recent data on the electroretinographic (ERG) responses of the dark adapted eye are presented, and the results are analyzed in terms of components and subcomponents of the near-threshold ERG. Rectangular pulses, 500–1000 millisec long, were produced on a television tube, and were repeated every 2 or every 4 seconds. The method of averaging responses to exclude errors and artifacts is described, and the results are discussed in detail. The components determined are: (1) a positive dc component, which may be newly discovered or identical to previously described components; (2) a negative potential, which possibly is the late rod receptor potential; and (3) three subcomponents, which probably represent spatial interactions in the retina. N.E.N.

N67-27707*# Woods Hole Oceanographic Institution, Mass.

AMINO ACIDS AND AMINO SUGARS IN CALCIFIED TISSUES OF PORTUNID CRABS

Francis G. Carey, Derek W. Spencer, and Egon T. Degens [1967] 14 p refs

(Contract NSR-22-014-001; Grant NSF G-816)

(NASA-CR-84429) CFSTI: HC $3.00/MF $0.65 CSCL 06A

The amino acid and amino sugar composition of representative regions in the exoskeleton were determined and these data were related to the calcification phenomena. The regions sampled were the soft uncalcified joint membrane between the carpus and merus of the cheliped, the flexible paddle of the pleopod, the cardiac and gastric regions of the carapace, the propodus, and dactylus of the cheliped. All samples were freed of extraneous tissues and subjected to decalcification, hydrolysis, and ion-exchange chromatography. Data on calcium, magnesium, and strontium obtained by atomic absorption spectroscopy and on phosphate by colorimetry were used as a measure of the degree of calcification of the individual organic matrix. C.T.C.

N67-27723# Joint Publications Research Service, Washington, D. C.

MECHANISM OF MEMORY

A. Turov 5 Apr. 1967 15 p ref Transl. into ENGLISH from Nauka i Zhizn' (Moscow), no. 2, 1967 p 40–47)

(JPRS-40357; TT-67-31181) CFSTI: $3.00

Presented is an analysis of the current status of research on the memory mechanisms of the human brain. Cited are studies of the relationship between memory based on comprehension, and that not based on comprehension; the localization of the different types of memory (short-term and long-term) in the human central nervous system; the so-called retroactive inhibition phenomenon; the bioelectrical activity of both individual brain formations and individual neuron groups; experimental models of nerve networks which explain how individual neurons are linked together so as to remember the characteristics of old signals and recognize new signals; the evolution of memory mechanisms in lower forms; conditioned reflexes in planarians; and the role of ribonucleoproteins in memory processes. It is surmised that close collaboration between neurophysiology and histochemistry, biochemistry, mathematics, and the present day analysis of clinical findings will assist in the solution of fundamental aspects of memory and subsequently the development of effective computer memory storage units. S.C.W.

N67-27772 Library of Congress, Washington, D. C. Aerospace Technology Div.

SOVIET BIOTECHNOLOGY AND BIOASTRONAUTICS, JANUARY 1966–JUNE 1966 Surveys of Foreign Scientific and Technical Literature

6 Mar. 1967 167 p refs

(ATD-67-13)

Abstracts covering the following general subject areas are presented: 1) Altered gravity, accelerations, vestibular reactions, extravehicular movement, and training for altered gravity conditions, 2) Noise, vibration, and ultrasound, 3) Radiation effects and dosimetry, 4) Biomedical effects of radio frequency and magnetic fields, 5) Hypothermia, clinical death, and reanimatology, 6) Altered

gas environments, 7) Astrobotany, exobiology, closed ecological systems, hydroponics, and algae, 8) Modeling of biological processes, human engineering, and man-machine factors, 9) Biomedical monitoring and biotelemetry, 10) Kosmos-110 biosatellite experiments, 11) manned flight results from Voskhod-1 and Voskhod-2, and 12) Soviet plans and prospects for manned flight. An alphabetical author index appears at the end of the text. L.S.

N67-27773# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

INFORMATION PROCESSING IN THE FUNCTIONAL VISUAL FIELD [INFORMATIEVERWERKING IN HET FUNKTIONEEL GEZICHTSVELD]

A. F. Sanders [1967] 16 p refs In DUTCH; ENGLISH summary (IZF-1967-6; TDCK-47866) CFSTI: HC $3.00/MF $0.65

It was found that performance in a number of visual tasks does not linearily decline as a function of visual angle. Instead, there are stepwise drops at two visual angles, which prove to be the boundaries of the areas where inspection by means of peripheral vision and eye movements are sufficient to obtain optimal performance. The drops are explained in terms of strategies in processing visual information, which are thought to vary from grouping signals at small visual angles to successive handling at very large angles. This theory is reevaluated in the light of more recent notions on visual coding and recoding. The relation between grouping and perceptual organization is especially considered. It is concluded that earlier reported work is restricted to the macrostructure of the functional visual field. Author

IAA ENTRIES

A67-26338
MEDICAL PROBLEMS DURING SPACE FLIGHTS TO MARS [RAUMFAHRTMEDIZINISCHE PROBLEME AUF DEM FLUGWEGE ZUM MARS].
Hubertus Strughold (USAF, Systems Command, Aerospace Medical Div., Brooks AFB, Tex.).
Astronautik, vol. 4, Jan.-Feb. 1967, p. 22-25. 7 refs. In German.

General discussion, from a medical standpoint, concerning the feasibility of a space mission to the planet Mars. Medical problems originating from changing gravity fields (earth, sun, and Mars), meteorite dangers (erosion effect and spacecraft penetration) and radiation from particle, electromagnetic, and thermal sources are examined. Psychological considerations, such as the effect of an eight-month space mission on members of the flight crew, and the possible disorientation effects of the mixing of diurnal and nocturnal phenomenon (occurring during the trip) are treated briefly. R.B.S.

A67-26456 #
DYNAMICS OF INTRACRANIAL PRESSURE AND OF BLOOD CONTENT IN THE CRANIAL CAVITY AT TRANSVERSE ACCELERATIONS UP TO 40 g [DINAMIKA KROVENAPOLNENIIA POLOSTI CHEREPA I VNUTRICHEREPNOGO DAVLENIIA PRI POPERECHNYKH PEREGRUZKAKH DO 40 ed].
Iu. E. Moskalenko, O. G. Gazenko, G. B. Vainshtein, I. I. Kas'ian, and A. A. Shurubura.
Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia, vol. 32, Mar.-Apr. 1967, p. 165-174. 30 refs. In Russian.

Results of intracranial pressure measurements and of an electroplethysmographic examination of blood content in the cranial cavity of a group of 35 dogs subjected under urethane anesthesia to increasing transverse accelerations between 2 and 40 g. Both the intracranial pressure and the blood content were increased by accelerations of up to 15 to 20 g and required 5 to 15 min for recovery. V.Z.

A67-26457 #
POSSIBLE VALUE OF ARTIFICIAL GRAVITY AS DETERMINED FROM THE ELECTROACTIVE STATE OF SKELETAL MUSCLES [O VOZMOZHNOI VELICHINE ISKUSSTVENNOI VESOMOSTI, OPREDELIAEMOI PO SOSTOIANIIU ELEKTROAKTIVNOSTI SKELETNYKH MYSHTS].
E. M. Iuganov and G. I. Pavlov.
Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia, vol. 32, Mar.-Apr. 1967, p. 286-290. 15 refs. In Russian.

Determination of the artificial gravity developed in the bodies of dogs carried by aircraft and subjected to back-to-chest acceleration in fixed laying position. The determination is made from changes in pulse frequency, respiration rate and bioelectrical activity of the femoral muscle, observed during alternate states of measurable g and zero g. An artificial gravity of 0.28 to 0.31 g is believed to be the lowest at which the electroactivity of the skeletal muscles in animals can be normal under acceleration. V.Z.

A67-26458 #
REMOTE RESPONSES OF THE HEMOPOIETIC TISSUE TO PROTON AND X-RAY IRRADIATION UNDER ACCELERATION [OTDALENNYE REAKTSII KROVETVORNOI TKANI NA OBLUCHENIE PROTONAMI I KH-LUCHAMI V KOMBINATSII S GRAVITATSIONNYMI NAGRUZKAMI].
E. I. Zharova, S. A. Khrustalev, T. G. Protasova, B. I. Davydov, V. V. Antipov, P. P. Saksonov, and M. O. Raushenbakh.
Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia, vol. 32, Mar.-Apr. 1967, p. 290-296. 18 refs. In Russian.

Investigation of the hemopoietic effect of various proton and X-ray doses in 6 groups of 218 mice subjected simultaneously to various levels of acceleration. The results are believed to suggest a certain leucomogenic effect from both radiations combined with acceleration. Further studies are urged. V.Z.

A67-26490 *
FURTHER EVIDENCE ON SECONDARY TASK INTERFERENCE IN TRACKING.
Merrill Noble, Don Trumbo, and Frank Fowler (Kansas State University of Agriculture and Applied Science, Manhattan, Kan.).
Journal of Experimental Psychology, vol. 73, no. 1, 1967, p. 146-149.
Grant No. NsG-606.

Indication from two experiments that (1) the presence of a second task throughout training in pursuit tracking resulted in a learning as well as a performance decrement at either transfer or retention tests, and (2) the locus of the interference appears to be in the selection of an overt response for the second task. This is because a "covert" response condition did not lead to a decrement in either task nor, when divested of any response selection requirement, did an overt response condition interfere with tracking performance. F.R.L.

A67-26491 *
SECONDARY TASK INTERFERENCE IN THE PERFORMANCE OF TRACKING TASKS.
Don Trumbo, Merrill Noble, and Jay Swink (Kansas State University of Agriculture and Applied Science, Manhattan, Kan.).
Journal of Experimental Psychology, vol. 73, no. 2, 1967, p. 232-240. 10 refs.
Grants No. AF AFOSR 526-64; No. NsG-606.

Examination of the effects of secondary verbal tasks on tracking performance. In the first experiment, redundancy was varied in both primary and secondary tasks, with the latter introduced at a retention session. The secondary task resulted in marked interference, independent of either primary or secondary task redundancy, primarily in the timing aspect of tracking. In the second experiment stimulus and response components of the secondary task were presented separately. The response component produced as much interference as the cognitively more difficult secondary task. The third experiment showed that secondary task effects occur independent of a retention interval. (Author)

A67-26584 *
EFFECTS OF VALINE ON PROTEIN SYNTHESIS AND TURNOVER IN PSEUDOMONAS SACCHAROPHILA UNDER "NONGRATUITOUS" INDUCING CONDITIONS.
H. L. Young and H. P. Klein (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.).
Journal of Bacteriology, vol. 93, Mar. 1967, p. 830-834. 16 refs.

Under "nongratuitous" inducing conditions, in Pseudomonas saccharophila, D- and L-valine and L-isoleucine inhibit net protein synthesis. At a concentration of 0.5 μmole or greater of valine per mg of bacterial protein, net protein synthesis declined approximately 70%. The inhibitory effect of valine is proportional to the exogenous valine concentration. Studies of ^{14}C amino acid incorporation and ^{14}C amino acid release from prelabeled cells indicate that valine stimulates protein turnover. (Author)

A67-26607 #
BIOLOGICAL CLOCKS - CIRCADIAN RHYTHMS [BIOLOGISCHE UHREN - CIRCADIANE RHYTHMEN].
K. Klotter (Darmstadt, Technische Hochschule, Institut für Mechanik, Darmstadt, West Germany).
(Gesellschaft für angewandte Mathematik und Mechanik, Wissenschaftliche Jahrestagung, Technische Hochschule Darmstadt, Darmstadt, West Germany, Apr. 12-16, 1966, Vortrag.)
Zeitschrift für angewandte Mathematik und Mechanik, vol. 46, Sonderheft, 1966, p. T13-T16. In German.

Discussion of the various biological cycles found in man, lower animals, and plants. It is shown that some of the simpler biological cycles of a mouse are very similar to the cycles of an oscillatory electric circuit. Reasons for the difficulty in constructing a suitable model for the various biological cycles are given. Plots are included showing the relationship between intensity of light and the rest/activity cycles of diurnal and nocturnal animals. R.B.S.

A67-26629 #
MATHEMATICAL MODEL FOR THE CIRCADIAN PERIODICITY [EIN MATHEMATISCHES MODELL FÜR DIE CIRCADIANE PERIODIK].
R. Wever (Max-Planck-Institut für Verhaltensphysiologie, Erling-Andechs, West Germany).
(Gesellschaft für angewandte Mathematik und Mechanik, Wissenschaftliche Jahrestagung, Technische Hochschule Darmstadt, Darmstadt, West Germany, Apr. 12-16, 1966, Vortrag.)
Zeitschrift für angewandte Mathematik und Mechanik, vol. 46, Sonderheft, 1966, p. T148-T157. 19 refs. In German.

Derivation of a model equation which describes satisfactorily the commonly known properties of the circadian periodicity. It is shown that all these properties derive from the fact that the circadian oscillation is simultaneously a self-excited, a parametrically excited, and a forced oscillation. V.P.

A67-26709 #
AN ANALYTIC MEASURE FOR THE DIFFICULTY OF HUMAN CONTROL.
Walter M. Hollister.
Institute of Navigation, Journal, vol. 20, Apr. 1967, p. 167-175. 7 refs.

Investigation of task difficulty in the design of systems for human control. An analytic measure of this subjective consideration is defined. The difficulty is a function of the lead factor which is an integrated measure of the amount of lead the human must produce. The theory together with experimental results imply that the performance function minimized by a human controller includes the amount of control as well as the amount of error. The difficulty is constrained by the capability, training, and stress level of the operator. Remnant is accounted for by assuming that the operator generates additive noise as a function of the difficulty. A model is presented which explains the experimental results of Bernotat (1967) with prediction display. R.B.S.

A67-26751 #
EXPERIMENTAL STUDIES IN SPACE PSYCHOPHYSIOLOGY [EKSPERIMENTAL'NYE ISSLEDOVANIIA V KOSMICHESKOI PSIKHOFIZIOLOGII].
V. V. Parin and F. D. Gorbov.
(Mezhdunarodnyi Kongress Psikhologov, 18th, Moscow, USSR, Aug. 1966.)
Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 7-12. 19 refs. In Russian.

Review of Soviet studies in space psychophysiology - a new branch of science initiated by the space flight of Gagarin. The complex effects on human psychology and physiology of the many environmental factors of a space flight are outlined and various approaches to the problems of the selection and medical control of cosmonauts are discussed in general terms. Some ground simulation experiments on human reactions to space flight stresses are mentioned. V.Z.

A67-26752 #
PROBLEMS OF GASTROENTEROLOGY IN SPACE MEDICINE AND THE PHYSIOLOGICAL BASIS OF COSMONAUTS' NUTRITION [PROBLEMY GASTROENTEROLOGII V KOSMICHESKOI MEDITSINE I FIZIOLOGICHESKIE OSNOVY PITANIIA KOSMONAVTOV].
I. M. Khazen.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 13-20. 39 refs. In Russian.

General consideration of the effects of acceleration and weightlessness on gastroenteric conditions of humans in the light of some data for Soviet and American cosmonauts. The various minor functional and physiological disorders experienced by individual cosmonauts are evaluated. A Sokovnin model of the neuroglandular apparatus of the gastro-intestinal tract is used in simulation experiments designed to investigate the relation between a cosmonaut's diet and his reactions to acceleration and weightlessness. V.Z.

A67-26753 #
CREATION OF SPACECRAFT LIFE SUPPORT SYSTEMS [PROBLEMY SOZDANIIA SISTEM ZHIZNEOBESPECHENIIA KOSMICHESKIKH KORABLEI].
B. A. Adamovich and G. G. Tern-Minas'ian.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 20-29. 21 refs. In Russian.

General consideration of sophisticated spacecraft life support systems with versatile functions. Such systems should ensure (1) protection from harmful external environmental effects such as radiation, weightlessness, meteorites, vacuum, etc.; (2) food, water, oxygen, and power supply; (3) removal of human waste and harmful wastes of spacecraft mechanisms; (4) maintaining of adequate working and living conditions with sufficient space and provisions for physical motion, rest, and recreation activities; and (5) medical attention. Diagrams are given for a life support system that depends on stored food and regenerates only oxygen and water and for a system that regenerates also carbohydrates and plant protein. V.Z.

A67-26754 #
PROBLEM OF SPACECRAFT HABITABILITY [K PROBLEME OBITAEMOSTI KOSMICHESKIKH KORABLEI].
Iu. G. Nefedov and S. N. Zaloguer.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 196 , p. 30-36. 19 refs. In Russian.

Discussion of the hygienic aspects of prolonged exposure of a spacecraft crew to spacecraft respiration conditions. The interrelation between humans and ambient media in an airtight space is analyzed on the basis of recent data on the chemical composition of the simulated spacecraft-capsule air, obtained in pressurized-chamber experiments on men. The bacterial autoflora of individual crew members is considered an important factor of contamination of the ambient medium. The concept of "biological compatibility" of spacecraft crew members is introduced as one of criteria for the selection of spacecraft crews. V.Z.

A67-26755 #
IMPROVEMENT OF THE RADIATION RESISTIVITY OF POTATOES IN CONDITIONS OF ANOXIA [POVYSHENIE RADIOREZISTENTNOSTI KARTOFELIA V USLOVIIAKH ANOKSII].
V. P. Dadykin, Iu. I. Shaidorov, D. F. Gertsuskii, I. S. Skukina, T. I. Nikishanova, I. V. Nikitina, and L. I. Finogenova.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 36-40. 19 refs. In Russian.

Investigation of the protective effect of anoxia on potato plants exposed to gamma-ray doses of 500, 1500, 3000, and 5000 rad in an atmosphere of nitrogen. The crop from irradiated plants grown in nitrogen was substantially higher, especially at higher radiation doses, than the crop of plants grown in a normal atmosphere. The starch content was also higher in the tubers of irradiated plants grown in the absence of oxygen. The investigation was designed to determine the suitability of potatoes as an onboard food supplier for spacecraft crews. V.Z.

A67-26756 #
CARDIAC CHANGES UNDER HYPOXIA - AN EXPERIMENTAL MORPHOLOGICAL STUDY [IZMENENIIA V SERDTSE PRI GIPOKSII - EKSPERIMENTAL'NO-MORFOLOGICHESKOE ISSLEDOVANIE].
V. V. Portugalov, O. G. Gazenko, V. B. Malkin, A. S. Kaplanskii, G. N. Durnova, E. I. Il'ina-Kakueva, and I. B. Krasnov.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 40-45. 17 refs. In Russian.

Experimental study of the structural and metabolic changes in the heart of a group of 60 male mice kept for two weeks at 378 torr in a pressure chamber. All the mice survived the exposure, preserved a healthy appearance, and showed only a slight loss of weight but suffered various clearly pronounced changes in the myocardium and valves attributed partly to cardiosclerosis. The results give no indication that adaptation to hypoxia could be beneficial to the human organism. V.Z.

A67-26757 #
NERVOUS REFLEX MECHANISMS OF HEMODYNAMIC SHIFT CONTROL DURING RAPIDLY AND SLOWLY INCREASING ACCELERATION [NERVNOREFLEKTORNYE MEKHANIZMY REGULIATSII GEMODINAMICHESKIKH SDVIGOV PRI BYSTROM I MEDLENNOM NARASTANII USKORENII].
E. B. Shul'zhenko.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 45-49. 6 refs. In Russian.

Study of the function of the cardiovascular system of dogs under morphine-chloralose-nembutal anesthesia during acceleration Systolic pressure and frequency of systolic contractions in the left ventricle, and systolic, diastolic, pulse and average pressure in the aorta during a systole are determined in two groups of dogs subjected for 1 min to chest-to-back acceleration of 9 g reached either in 30 sec or in 2-1/2 min. The results showed a better adaptivity of the blood circulation system to the slower rate of acceleration buildup. V. Z.

A67-26758 #
RESPONSE OF INDIVIDUAL NEURONS OF THE OPTICAL CORTEX OF CATS TO VESTIBULAR STIMULATION [REAKTSIIA ODINOCHNYKH NEIRONOV ZRITEL'NOI OBLASTI KORY GOLOVNOGO MOZGA KOSHEK NA RAZDRAZHENIE VESTIBULIARNOGO APPARATA].
M. G. Kutateladze.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 49-52. 13 refs. In Russian.

Study of the effect of vestibular stimulation on the activity of neurons of the optical cortex of curarized cats under vertical acceleration of 0.1 to 2 g. Extracellular activity of a total of 89 individual optical cortex neurons is recorded with the aid of glass microelectrodes. V. Z.

A67-26759 #
SYNTHESIS OF TISSUE PROTEINS IN HYPODYNAMIC ANIMALS [O SINTEZE TKANEVYKH BELKOV U ZHIVOTNYKH PRI GIPODINAMII].
I. V. Fedorov, V. N. Vinogradov, Iu. I. Milov, and L. A. Grishanina.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 53-57. 8 refs. In Russian.

Study of the protein synthesis in liver, kidney, heart, spleen, skeletal-muscle, and small-intestine tissues of hydrodynamic rats with the aid of C^{14}-tagged glycine, alanine, and phenyl alanine, and S^{35}-tagged methionine. Migration of the tagged amino acids was depressed in all experimental rats, especially in ones which were kept longer under hypodynamic conditions. V. Z.

A67-26760 #
ACCELERATION PROBLEMS IN SPACE PHYSIOLOGY [PROBLEMY USKORENII V KOSMICHESKOI FIZIOLOGII].
A. S. Barer.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 57-64. 12 refs. In Russian.

General consideration in the light of Soviet and some American experiences of problems of space physiology posed by acceleration. The problems involve hemodynamic, respiratory, and cardiovascular effects of slow and rapid acceleration along with aerodynamic impact, landing impact, and purely mechanical effects of abrupt changes in velocity. Human endurance, the alleviation of these negative effects, and engineering aspects of impact absorption are also discussed. V. Z.

A67-26761 #
RADIATION SAFETY OF SPACE FLIGHTS - RADIOBIOLOGICAL ASPECTS [OBESPECHENIE RADIATSIONNOI BEZOPASNOSTI KOSMICHESKIKH POLETOV - RADIOBIOLOGICHESKIE ASPEKTY].
Iu. G. Grigor'ev and E. E. Kovalev.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 64-69. In Russian.

General consideration of radiation hazards and safety requirements for brief and extended manned space flights, based on Soviet space radiation environment data. The interaction of cosmic particles with human tissues is discussed briefly, and permissible doses of radiation during flights to the moon and Mars are estimated. Extensive further studies are suggested. V. Z.

A67-26762 #
USE OF ONBOARD COMPUTERS FOR MEDICAL TESTS AND RESEARCH DURING SPACE FLIGHTS [PROBLEMY ISPOL'ZOVANIIA BORTOVYKH VYCHISLITEL'NYKH MASHIN DLIA VRACHEBNOGO KONTROLIA I MEDITSINSKIKH ISSLEDOVANII V KOSMICHESKOM POLETE].
R. M. Baevskii.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 69-75. 11 refs. In Russian.

Discussion of procedures for constructing algorithms for computerized medical diagnostic observations during manned space flights. The procedures permit information input directly from the cosmonaut in the onboard computer, an automatic appraisal of the cosmonaut's physical conditions, and the information transmission to a ground receiver through low-capacity telemetric channels. Various types of algorithms are considered and suitable ones are selected. The significance of onboard computerized medical control for manned space flights is stressed. V. Z.

A67-26763 #
SOME PROBLEMS IN THE SELECTION OF RESEARCH ASTRONAUTS [NEKOTORYE PROBLEMY OTBORA KOSMONAVTOV-ISSLEDOVATELEI].
P. I. Egorov, G. P. Mikhailovskii, M. M. Korotaev, T. V. Benevolenskaia, N. M. Boglevskaia, T. N. Krupina, I. A. Maslov, T. A. Petrova, and I. Ia. Iakovleva.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 75-78. 7 refs. In Russian.

Discussion of the basic physical and mental aspects in the selection of scientifically qualified individuals as spacecraft crew members. The complexity and versatility of physical and psychological requirements are pointed out. The advantages and disadvantages of different age groups are compared in terms of general health, scientific background, and flying experience. The selection of mature scientists even though without a previous flying background rather than young graduates is thought to be more advisable at the present time. V. Z.

A67-26764 #
PROPHYLAXIS FOR THE NEGATIVE EFFECT OF HYPOKINESIA ON THE HUMAN CARDIOVASCULAR SYSTEM [PROFILAKTIKA OTRITSATEL'NOGO VLIIANIIA GIPOKINEZII NA SERDECHNO-SOSUDISTUIU SISTEMU CHELOVEKA].
P. V. Buianov, A. V. Beregovkin, and N. V. Pisarenko.
Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 78-82. 18 refs. In Russian.

Discussion of prophylactic measures for the protection of the cardiovascular system of spacecraft crew members from impairment by hypokinesia. Arterial oscillograms, tachograms, and cardiac cycle phases are recorded in the study of hemodynamics on 13 male individuals subjected for 10 to 12 days to hypokinetic conditions. A tentative evaluation of the results is given and some measures are suggested to remedy the negative cardiac manifestations of hypokinesia. V. Z.

A67-26849
THEORETICAL INVESTIGATION CONCERNING THE FORMATION OF GAS EMBOLISMS AND GAS BUBBLES IN TISSUE [THEORETISCHE UNTERSUCHUNGEN ZUR ENTSTEHUNG VON GASEMBOLIEN UND GASBLASEN IM GEWEBE].
S. Ruff (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany).
(Mainz, Universität, Institut für Anaesthesiologie, Colloquium, Mainz, West Germany, June 9, 1965, Vortrag.)
Anaesthesist, vol. 15, Oct. 1966, p. 317-319. In German.

Description of an electrical model which serves as an aid for the study of gas transport from lungs to cells and vice versa. Time constants and the maximum flow of transported gases are derived. The use of high-pressure chambers for treatment of embolisms is briefly examined. The system is illustrated by block diagrams with quadrupole elements. R. B. S.

A67-26850
PATHOGENESIS AND THERAPY OF AIR EMBOLISM IN TERMS OF THE PROBLEM OF TREATMENT IN OVERPRESSURE [PATHOGENESE UND THERAPIE DER LUFTEMBOLIE IM HINBLICK AUF DIE PROBLEMATIK DER BEHANDLUNG IM ÜBERDRUCK].
H. Hartmann (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany).
(Mainz, Universität, Institut für Anaesthesiologie, Colloquium, Mainz, West Germany, Nov. 24, 1965, Vortrag.)
Anaesthesist, vol. 15, Nov. 1966, p. 359-363. 9 refs. In German.

Discussion of the air embolism mechanism, resulting from the escaping of air through the aveolar tissue or from the appearance of dissolved gases in the blood vessels due to a sudden drop in pressure outside of the lungs. A model lung is described, and the results of an overpressure experiment performed on the respiratory systems of rabbits is treated. A table is given which describes various degrees of seriousness in embolism cases as a function of depth under water. The three most important factors in air embolism study are noted to be the partial pressure of CO_2, of O_2, and of inert gas. The treatment of embolism cases through use of a high-pressure chamber is discussed. R. B. S.

A67-26867 *
IONIZING RADIATION AND BACTERIA - NATURE OF THE EFFECT OF IRRADIATED MEDIUM.
H. E. Frey and Ernest C. Pollard (Pennsylvania State University, Biophysics Dept., University Park, Pa.).
Radiation Research, vol. 28, July 1966, p. 668-676. 8 refs.
Grant No. NsG-324.

Description of experiments aimed at explaining the action of irradiated medium, showing that the effect on bacterial cells is due to hydrogen peroxide generated in the medium and that the nature of the action is to inhibit the synthetic processes of the cell. The duration of this inhibition is dependent on the amount of hydrogen peroxide in the medium. It is also shown that the interaction between cells and hydrogen peroxide is much stronger if the cells are living and much less if the peroxide is exposed to cell contents. F. R. L.

A67-26868 *
RESPONSE OF THE DBA/2J MOUSE STRAIN TO ACUTE IONIZING RADIATION - THE BIPHASIC DEATH PATTERN.
John M. Yuhas, David P. Jacobus, and John W. Crenshaw (U. S. Army, Walter Reed Army Institute of Research, Div. of Medicinal Chemistry, Washington, D. C.; Maryland, University, Dept. of Zoology, College Park, Md.).
Radiation Research, vol. 28, Aug. 1966, p. 804-810. 9 refs.
Grant No. NsG(T)-3.

Demonstration that the DBA/2J strain of mice respond to lethal irradiation by way of a fourth-week syndrome in addition to the normal medullary syndrome. This fourth-week syndrome, which is not seen in the outbred WR-BS strain, is induced at a lower dose than is the medullary syndrome. Increases in the medullary deaths, mediated by joint housing with the WR-BS after irradiation, do not eliminate the fourth-week syndrome from the lethal response of the DBA/2J. Intra-strain crowding has been shown to increase the lethal efficiency of the fourth-week syndrome. F. R. L.

A67-26916 #
COMPARISON OF HELIUM AND NITROGEN IN PRODUCTION OF BENDS IN SIMULATED ORBITAL FLIGHTS.
Sarah E. Beard, Thomas H. Allen, Robert G. McIver, and Richard W. Bancroft (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Physiology Branch, Brooks AFB, Tex.).
Aerospace Medicine, vol. 38, Apr. 1967, p. 331-337. 19 refs.
USAF-sponsored research.

Comparison of the effect of diluent gases in evoking flyer's bends by means of denitrogenation for 4 hr, then decompression from 14.5 to either 7 or 5 psia with exposure of several hr to oxygen and to mixtures of oxygen and a diluent gas, and a further decompression to 3.5 psia in pure oxygen, together with exercise. Compared to nitrogen, helium causes symptoms to appear sooner and to affect more men even though peripheral venous blood, in equilibrium with alveolar gas, contains less helium than nitrogen. The results of 334 man-flights suggest application of diffusion theory to formation, as opposed to growth, of bubbles from these gases. M. M.

A67-26917 #
REPEATED, PROLONGED, LOW INTENSITY $+G_Z$ EXPOSURES - ANATOMICAL STUDIES IN BABOONS.
R. P. Menninger, R. H. Murray, and F. R. Robinson (Indiana University, Cardiopulmonary Laboratory, Bloomington, Ind.; USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Toxicology Branch, Wright-Patterson AFB, Ohio).
Aerospace Medicine, vol. 38, Apr. 1967, p. 337-339. 15 refs.
Contract No. AF 33(616)-8378.

Evaluation of repetitive stress in mammals with predominant upright posture, excluding anesthesia effects, and using a short-radius centrifuge to provide periodic, prolonged, low-intensity acceleration stress. Four healthy baboons, lightly tranquilized but not anesthetized, were exposed to +2.2 G_Z (at the xiphoid), 1 hr daily, 5 days per week for 6 weeks. Two baboons were tranquilized similarly but not centrifuged. One baboon died unexpectedly during the fifth hour of centrifugation; at autopsy there were no significant lesions. The other baboons were autopsied 10 days after the completion of the program. Two of the centrifuged baboons had several very small hematomas in the lung bases; the kidneys and all other organs were normal in all animals. M. M.

A67-26918 * #
PATHOLOGY OF ANIMALS EXPOSED FOR PERIODS UP TO 92 DAYS TO A PURE OXYGEN ATMOSPHERE AT REDUCED PRESSURE.
David T. Harper, Jr. and Farrel R. Robinson (USAF, Washington, D.C.).
Aerospace Medicine, vol. 38, Apr. 1967, p. 340-344. 11 refs.
USAF-NASA-sponsored research.

Experimental investigation in which dogs, monkeys, rats, and mice were exposed for periods up to 92 days to an atmosphere of 93-98% oxygen at approximately 258 mm Hg. During the study, 20% of the rats and two mice died of severe pulmonary edema and congestion. Pulmonary infectious disease increased in incidence among rats and dogs. Vacuolar, probably edematous, lesions of the pulmonary artery media appeared in 55% of exposed rats and 36% of the exposed mice examined, while no control animals had this lesion. No dose-response relationship was found between duration of exposure and any pathologic entity. All investigators using rats, dogs, and monkeys in pulmonary toxicological studies are warned of the high incidence of pulmonary disease in these animals. M. M.

A67-26919 *
COMPUTER ANALYSIS OF EEG DATA FROM GEMINI FLIGHT GT-7.
W. R. Adey, R. T. Kado, and D. O. Walter (California, University, Center for Health Sciences, Brain Research Institute, Space Biology Laboratory, Los Angeles, Calif.).
Aerospace Medicine, vol. 38, Apr. 1967, p. 345-359. 16 refs.
Grants No. NsG-1970; No. NsG-505.

A computed analysis, using digital techniques, was performed on closely spaced samples of 55 hr of EEG data from Astronaut Borman, with calculation of auto-spectral and cross-spectral density distributions and coherence functions. Flight data were compared with extensive baseline collections from the same subject in laboratory task performances, in a Gemini flight simulator, and in sleep. Two channels were recorded for the first 29 hr of flight and one thereafter. A detailed analysis of the prelaunch period and first orbit indicated an anticipatory arousal before launch, with changes in power

distribution and coherence during the first orbit consistent with strong orienting reactions. Careful assessment of awake flight records throughout the remainder of the 55 hr indicated increased power in the theta band (4 to 7 cps) by comparison with laboratory and flight simulator data. The genesis of this increased theta rhythm in orienting reactions associated with initial exposure to weightlessness is discussed, and the need emphasized for data gathered at later times in longer flights to elucidate persistent shifts from groundbased norms. Sleep analyses from the first two "nights" in space are presented, with clear evidence of minimal sleep on the first night, and four consecutive normal 90-min cycles on the second night. The sensitivity of EEG records to changing states of alertness and focused attention is reviewed, and the value of the method, in conjunction with adequate computation, for pilot-astronaut monitoring is emphasized. (Author)

A67-26920 *

VESTIBULAR EXPERIMENTS IN GEMINI FLIGHTS V AND VII.

Ashton Graybiel, Earl F. Miller, II (U.S. Naval Aviation Medical Center, Aerospace Medical Institute, Pensacola, Fla.), John Billingham (NASA, Ames Research Center, Moffett Field, Calif.), Richard Waite, Charles A. Berry, and Lawrence F. Dietlein (NASA, Manned Spacecraft Center, Houston, Tex.).

Aerospace Medicine, vol. 38, Apr. 1967, p. 360-370. 33 refs. NASA-supported research.

Two experimental probes were carried out involving the astronauts who were exposed to weightlessness for periods of 8 days in GT 5 and 14 days in GT 7. One experiment dealt with nonvisual influences which might affect egocentric visual localization of the horizontal. The astronauts' task was to set a dim line of light, in an otherwise dark field, to an external horizontal reference; in weightlessness this reference was the recollection of an element of the spacecraft horizontal with respect to their seat; preflight and postflight it was their recollection of things horizontal with reference to the earth while they were in a device upright with respect to gravity. The outstanding inflight findings were the small intratest and intertest variances manifested by all of the astronauts and the high degree of accuracy in the settings made by three of the four astronauts. These results suggest that lifting the gravitational load from the otolith organs did not result in any disturbance of central nervous system integrative processes which might have influenced the visually perceived direction of space. Moreover, the combination of removal of otolith modulating effects on tactile and kinesthetic sensory systems and the unusual pattern of agravic pressure and kinesthetic sensory inputs, factors which might be expected to increase variances in settings, did not do so. Whether agravic sensory information of this nature can influence, in a positive manner, the setting of a dim line of light in darkness remains to be demonstrated. The second experiment consisted in the preflight and postflight measurement of ocular counterrolling which depends, for the greater part at least, on a reflex response having its genesis in the otolith apparatus. No significant differences between preflight and postflight responses were demonstrated. (Author)

A67-26921 *

ELECTROENCEPHALOGRAPHIC BASELINES IN ASTRONAUT CANDIDATES ESTIMATED BY COMPUTATION AND PATTERN RECOGNITION TECHNIQUES.

D. O. Walter, R. T. Kado, J. M. Rhodes, and W. R. Adey (California, University, Center for Health Sciences, Brain Research Institute, Space Biology Laboratory, Los Angeles, Calif.).

Aerospace Medicine, vol. 38, Apr. 1967, p. 371-379. 30 refs. Grants No. NsG-1970; No. NsG-505.

Description of methods used in the acquisition and analysis of electrophysiological data from 200 astronaut candidates. Data from 50 of these subjects were analyzed for the establishment of baselines covering a wide range of states of wakefulness and sleep. Accurately timed physiological stimuli and perceptual and learning tasks were presented to all subjects, thus allowing fine comparison between subjects and the establishment of group means for records from each test situation. Spectral analyses were performed by digital methods for each of the 18 scalp EEG channels with leads located according to a modified 10-20 plan. In each case, despite wide individual differences between subjects, the group mean and/or pattern of variance in spectral densities for each test condition presented a characteristic pattern. These patterns were consistent with neurophysiological observations on organization of corticosubcortical interrelations and cerebral systems. M. M.

A67-26922

METABOLIC RATES DURING LUNAR GRAVITY SIMULATION.

W. G. Sanborn and E. C. Wortz (Garrett Corp., AiResearch Manufacturing Co., Los Angeles, Calif.).

Aerospace Medicine, vol. 38, Apr. 1967, p. 380-382. 6 refs.

Previous research by Wortz and Prescott had shown lower metabolic rates for walking in a six-degree-of-freedom (D. O. F.) gimbal simulator than in a four D. O. F. vertical suspension simulator. The experiment reported here was to evaluate the effects of walking at simulated 1/6 gravity using the "inclined-plane" technique of Hewes and Spady. The "inclined-plane" simulator is a four D. O. F. simulator. No differences in metabolic were found between the inclined-plane and the "four D. O. F. vertical suspension simulators for walking rates of 2 mph and 4 mph. (Author)

A67-26923

CRITICAL RE-EVALUATION OF THE HUMAN TRANSFER FUNCTION PROBLEM. II.

Aleeza Cerf Beare and Arthur Kahn (Westinghouse Electric Corp., Atomic, Defense and Space Group, Human Factors Laboratory, Baltimore, Md.).

Aerospace Medicine, vol. 38, Apr. 1967, p. 383-389. 12 refs.

A study of compensatory tracking was performed on an analog computer simulation to test the application of the superposition theorem to human tracking performance. Four subjects participated in a 4x4x4x3x3x2 analysis of variance design in which the input variables of frequency, amplitude, stick and scope sensitivity and noise conditions were varied systematically. The performance data of error and stick movement and the ratio of these two measures - i.e., the gain - were subjected to an analysis of variance performed on a digital computer. The results showed that the linearity assumption is not a valid assumption. The variable underlying performance is the average rate of stick motion. Using the rate variable, a transfer function was derived which provides an adequate fit between the empirically derived and the theoretically calculated data. The conclusions show that error increases and gain decreases as a direct function of average rate of stick motion and that the presence of noise has an effect similar to that of increasing the rate. (Author)

A67-26924

NEUROLOGICAL SEQUELAE OF PROLONGED DECOMPRESSION.

A. N. Nicholson and J. Ernsting (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).

Aerospace Medicine, vol. 38, Apr. 1967, p. 389-394. 24 refs.

Experimental investigation in the baboon of the physiological effects of prolonged decompressions which simulate the loss of cabin pressure resulting from small structural failures in the cabin of a transport aircraft operating at high altitude. Three profiles were investigated which simulated decompressions arising from defects 4, 6, and 8 in. in diameter in a cabin of a hypothetical aircraft. The profiles included a maximum altitude of 30,000 ft with a time of 3 min above 25,000 ft and a maximum altitude of 53,000 ft with a time of 1 min 25 sec above 50,000 ft. The former decompression produced impaired consciousness with an apparently complete recovery while the latter was fatal. The decompression profile which simulated a 6-in.-diam defect had a maximum altitude of 42,500 ft with a time of 1 min 30 sec above 40,000 ft and resulted in permanent brain damage. The nature and significance of the neurological disturbances are discussed. M. M.

A67-26925

FLASHBLINDNESS - THE EFFECTS OF PREFLASH ADAPTION AND PUPIL SIZE.

Gloria T. Chisum and J. H. Hill (U.S. Naval Material Command, Naval Air Development Center, Aerospace Medical Research Laboratory, Johnsville, Pa.).

Aerospace Medicine, vol. 38, Apr. 1967, p. 395-399. 7 refs.

Examination of the extent to which the blinding effect of a flash from a nuclear weapon will vary with the ambient light level. Under conditions of darkness, the size of the pupil and the sensitivity of the eye are maximized. With an increase in the ambient light level both the sensitivity of the eye and the pupil size decrease. Data are presented on the independent effects of pupil size and receptor adaptation level on the production of flashblindness by high intensity, short-duration flashes. M.M.

A67-26926
EFFECTS OF LONG-TERM PERIODIC ADMINISTRATION OF HYPERBARIC OXYGEN ON BODY AND ORGAN WEIGHTS, HISTOLOGY AND HEMATOLOGY OF THE MOUSE.
Benjamin V. Siegel (Oregon, University, Medical School, Dept. of Pathology, Portland, Ore.).
Aerospace Medicine, vol. 38, Apr. 1967, p. 399-401.
AEC Contract No. RLO-1927-11.

Investigation of the effects of repeated short treatments of BALB/c mice with hyperbaric oxygen at about 3.4 atm absolute pressure, administered over a period of 130 days, on organ and body weights and hematologic and histologic development. Such treatment did not result in significant changes in body, liver or adrenal weights and likewise had no effect on total nucleated and differential blood cell counts. Thymus and spleen were reduced during the first 3 to 4 weeks of oxygen treatment, but subsequently returned to normal weight values. The histologic appearance of the organs studied, including the central nervous system, was normal. M.M.

A67-26927
USE OF ROLL-ANGLE INDICATORS FOR AVOIDING SPATIAL DISORIENTATION DURING INSTRUMENT FLIGHT.
H. von Diringshofen.
Aerospace Medicine, vol. 38, Apr. 1967, p. 401.

Discussion of the possibility that experienced pilots will subconsciously use the roll-angle indicator for speedy correction of extreme bank attitudes, if the indicator is immediately below the artificial horizon. The pilots then use the artificial horizon to obtain the proper glide path angle or angle of ascent, respectively. This method has the advantage that the mark on the roll indicator will follow the movements of the control stick to an angle of 90°. With the exception of inverted flying, the human engineering requirement of identical movement of controls and indicators is in this way fulfilled. It is noted that this way of using the roll-angle indicator should be pointed out to pilot students during instrument flight and simulator training. M.M.

A67-26928
AEROMEDICAL PROBLEMS ASSOCIATED WITH SURGICAL PROCEDURES FOR THE RELIEF OF OTOSCLEROSIS.
William F. Ashe, Charles E. Billings, and Frederick H. Shillito (Ohio State University, Dept. of Preventive Medicine, Columbus, Ohio).
Aerospace Medicine, vol. 38, Apr. 1967, p. 407-411. 7 refs.
NIH Grant No. EF-00036-03.

A survey was conducted in which 107 airmen with otosclerosis answered a questionnaire regarding their disorder. 99 airmen had had surgery for relief of hearing loss; data were obtained from the surgeons who had operated on 80 of these airmen. It was found that four airmen had experienced difficulty due to dislodged prostheses. Responses from surgeons indicated that half of those responding had treated such complications. The prosthesis usually involved was a polyethylene tube strut, though eight surgeons had seen wire struts become dislodged. It is suggested that airmen requiring surgery for otosclerosis inform their surgeons of their flying interests. Surgeons should use wire struts in these cases, where possible. Airmen should be observed for Eustachian tube patency and for signs of vertigo or sudden pressure change in the middle ear prior to returning to flying status. Airmen who have been free of symptoms for two years following surgery are believed to be unlikely to develop complications due to disruption of a prosthesis thereafter. (Author)

A67-26929
SECOND-ORDER FACTORS IN AIR TRAFFIC CONTROL SPECIALISTS.
Samuel Karson (Eastern Michigan University, Dept. of Psychology, Ypsilanti, Mich.).
Aerospace Medicine, vol. 38, Apr. 1967, p. 412-414. 10 refs.

Identification of the second-order personality factors (PFs) in a sample of 124 air traffic control specialists. The controllers were tested with the 16 Personality Factor Questionnaire which included a motivational distortion scale for "faking good." The 16 PF scores were then intercorrelated by means of Pearson product-moment correlation coefficients to achieve a matrix of intercorrelations. An iterative principal axis factor analysis was accomplished, and nine second-order factors were extracted and identified. M.M.

A67-27213 #
TELEFACTOR CONTROL OF SPACE OPERATIONS.
William E. Bradley (Institute for Defense Analyses, Washington, D.C.).
Astronautics and Aeronautics, vol. 5, May 1967, p. 32-38.

Review of some of the essential characteristics of telefactor systems in the control of space operations. Technological and design aspects are described of a telefactor system which is a combination of master-slave manipulator servomechanism with a television system and an electronic communication link. The operator is provided with remote manipulating apparatus in which the remote tongs are moved by servomechanisms in accordance with motions of the operator's hands, and in which force feedback is provided so that the operator can feel the objects grasped. Each joint of such a manipulator is controlled by an individual servomechanism which operates independently of all other joints. An important aspect is head-controlled television in which the camera is supported by an additional manipulator arm. Kinematic similarity between the control harness and the telefactor is emphasized. The operation of the television system is analyzed and the functioning of the telefactor in a space vehicle described. T.M.

A67-27214 #
HAS MAN QUALIFIED FOR LONG-DURATION SPACE FLIGHTS?
Loren D. Carlson (California, University, School of Medicine, Div. of Sciences Basic to Medicine, Davis, Calif.).
Astronautics and Aeronautics, vol. 5, May 1967, p. 40-44.

Review of medical data on in-flight and postflight physiological performance to determine man's qualifications for long-duration space flights. Heart and respiration rates for the Gemini 4 pilot are presented in a chart and discussed together with Russian reports from the long flights of the Vostok spacecraft. The evidence of impaired manual performance in the weightless state and during extravehicular activity is analyzed from Russian studies and Mercury (MA-8) data. Following flight there is evidence of physiological change - a marked weight loss, a tachycardia at rest, a postural hypotension, hematological changes, and changes in fluid balance and calcium balance. These deviations and their return to normal level are analyzed. Measurements of the mass of red cells in the blood and the volume of the plasma have been made before and after flight, and the data showing the results for Gemini missions are presented. Longer flights are necessary to extrapolate beyond 30 day periods. T.M.

A67-27259
INTERNATIONAL SIMULATION AND TRAINING CONFERENCE, 3RD, NEW YORK, N.Y., APRIL 24-27, 1967, PROCEEDINGS.
Conference sponsored by the Society of Automotive Engineers.
New York, Society of Automotive Engineers, Inc., 1967. 141 p.
Members, $7.00; nonmembers, $10.00.

CONTENTS:

THE ROLE OF HUMAN FACTORS IN ESTABLISHING TRAINING REQUIREMENTS.

ADVANCES IN THE USE OF COMPUTERS FOR HANDLING HUMAN FACTORS TASK DATA. Lawrence E. Reed (USAF, Systems Command, Wright-Patterson AFB, Ohio), p. 1-13. 9 refs. [See A67-27260 13-05]

A67-27260 * #

ADVANCES IN THE USE OF COMPUTERS FOR HANDLING HUMAN FACTORS TASK DATA.

Lawrence E. Reed (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Behavioral Sciences Laboratory, Wright-Patterson AFB, Ohio).

IN: INTERNATIONAL SIMULATION AND TRAINING CONFERENCE, 3RD, NEW YORK, N.Y., APRIL 24-27, 1967, PROCEEDINGS. [A67-27259 13-05]
Conference sponsored by the Society of Automotive Engineers.
New York, Society of Automotive Engineers, Inc., 1967, p. 1-13.
9 refs.
NASA-sponsored research; USAF Contract No. F 33615-67-C-1036.

Review of problems that task-data analysts must consider, and suggestion of possible solutions. A review of task-analysis procedures is followed by a discussion of the uses of task analysis in system development programs. Problems connected with each which were used to generate the goals of a research program are studied; the program is involved with the development of computerized techniques which assist the analyst in making better use of available data. B.B.

A67-27261

THE NEW LOOK IN TWA TRAINING.

D. M. Crowley (Trans World Airlines, Inc., Kansas City, Mo.).

IN: INTERNATIONAL SIMULATION AND TRAINING CONFERENCE, 3RD, NEW YORK, N.Y., APRIL 24-27, 1967, PROCEEDINGS. [A67-27259 13-05]
Conference sponsored by the Society of Automotive Engineers.
New York, Society of Automotive Engineers, Inc., 1967, p. 14-24.

Description of the DC-9 training program, which is based on the "instructional systems approach," a highly structured and controlled learning method. It uses a classroom responder system and other learning aids of the programed type. The program results in a 30% reduction in training time. B.B.

A67-27262

MEDICAL/HUMAN FACTORS ASPECTS OF JETLINER FLIGHT IN SEVERE TURBULENCE.

C. R. Harper (United Air Lines, Inc., Elk Grove Township, Ill.).

IN: INTERNATIONAL SIMULATION AND TRAINING CONFERENCE, 3RD, NEW YORK, N.Y., APRIL 24-27, 1967, PROCEEDINGS. [A67-27259 13-05]
Conference sponsored by the Society of Automotive Engineers.
New York, Society of Automotive Engineers, Inc., 1967, p. 25-31.
9 refs.

Investigation of the medical and human factors which can affect the jetliner pilot during atmospheric turbulence. It is concluded that flight crews should be properly strapped in during all phases of flight, should trust the gyrohorizon as the only reliable attitude indicator, and should be aware that "railroad track" disturbances may end in severe turbulence. B.B.

A67-27268

FLIGHT SIMULATOR MOTION, ITS ENHANCEMENT AND POTENTIAL FOR FLIGHT CREW TRAINING.

Frank H. Borlace (CAE Industries, Ltd., Montreal, Canada).

IN: INTERNATIONAL SIMULATION AND TRAINING CONFERENCE, 3RD, NEW YORK, N.Y., APRIL 24-27, 1967, PROCEEDINGS. [A67-27259 13-05]
Conference sponsored by the Society of Automotive Engineers.
New York, Society of Automotive Engineers, Inc., 1967,
p. 60-65. 16 refs.

Discussion of the importance of motion cues in flight-handling training, and indication that the ability to use motion cues results in habit patterns which are applicable to handling an aircraft. The human vestibular system is examined, and the information which the pilot receives from it is shown to be of a "phase advance" nature. Some programing considerations of motion systems are given; the desirability of custom-designing the motion system to aid in training the pilot in specific tasks is also studied. B.B.

A67-27272

A REVIEW OF THE CURRENT POLICY IN THE UNITED KINGDOM FOR THE USE OF FLIGHT SIMULATORS IN FLIGHT CREW TRAINING AND CHECKING.

W. E. B. Griffiths (Board of Trade, Civil Aviation Dept., London, England).

IN: INTERNATIONAL SIMULATION AND TRAINING CONFERENCE, 3RD, NEW YORK, N.Y., APRIL 24-27, 1967, PROCEEDINGS. [A67-27259 13-05]
Conference sponsored by the Society of Automotive Engineers.
New York, Society of Automotive Engineers, Inc., 1967, p. 116-118.

Discussion of the background of flight simulator acceptance in the UK. It is indicated why, with the advent of SSTs and jumbo jets, flight simulators will play a larger role in pilot training and checking. B. B.

A67-27273
CAN FLIGHT TRAINING TAKE LESSONS FROM OUR ASTRONAUT TRAINING PROGRAM?
Robert S. Buchanan (USAF, Systems Command, Flight Test Center, Aerospace Research Pilot School, Edwards AFB, Calif.) and John Prodan (USAF, Systems Command, Flight Test Center, Aerospace Research Pilot School, Simulation Div., Edwards AFB, Calif.).
IN: INTERNATIONAL SIMULATION AND TRAINING CONFERENCE, 3RD, NEW YORK, N.Y., APRIL 24-27, 1967, PROCEEDINGS. [A67-27259 13-05]
Conference sponsored by the Society of Automotive Engineers.
New York, Society of Automotive Engineers, Inc., 1967, p. 119-123.

Study of the applicability of astronaut training techniques to training methods for pilots of conventional aircraft. It is decided that (1) each phase of flight training would benefit by using the same instructor in all areas of instruction, and (2) extensive use of high-fidelity simulation devices is desirable to provide the pilot with the knowledge necessary for understanding and solving the problems of flight in more than a procedural sense. B. B

A67-27274
EXPERIMENTAL DEVICE FOR THE STUDY OF THE PHYSIOLOGICAL FUNCTIONS OF EQUILIBRATION.
P. Vidal and J. M. Toulotte (Lille, Université, Faculté des Sciences Lille, France).
IN: INTERNATIONAL SIMULATION AND TRAINING CONFERENCE 3RD, NEW YORK, N.Y., APRIL 24-27, 1967, PROCEEDINGS. [A67-27259 13-05]
Conference sponsored by the Society of Automotive Engineers.
New York, Society of Automotive Engineers, Inc., 1967, p. 124-127.

Graphical demonstration of human reaction to a shock or vibration input in the horizontal plane. Subjects are displaced while standing on a calibrated platform; it is found that learning times to regain equilibrium are improved if subjects can watch a graphical plot of their reactions. B. B.

A67-27336 #
CHLORELLA ON BOARD COSMOS 110 [KHLORELLA NA BORTU "KOSMOSA-110"].
E. N. Vaulina, I. D. Anikeeva, and G. P. Parfenov.
Kosmicheskie Issledovaniia, vol. 5, Mar.-Apr. 1967, p. 285-292. 14 refs. In Russian.

Study of the effect of space-flight factors on the mutability, survival rate, and dynamics of development of cells of inactive cultures of three strains of chlorella (LARG-1, LARG-3, and LARG-5). No increase or decrease in the percentage of pigmented, spotted, and morphological mutations is noted in material which has been in outer space. In analyzing the first sporulation of cultures of strains LARG-1 and LARG-3, a delay in the entry of the cells into the first sporulation is noted, as well as an increase in the number of cells dividing into a smaller-than-usual number of autospores. A certain decrease in the survival rate of experimental groups of these strains is noted in comparison with the control. Cells of the strain LARG-3 are found to be more sensitive to the action of space-flight factors than cells of the strain LARG-1. A. B. K.

A67-27337 #
RECESSIVE LETHALS IN THE X CHROMOSOME OF DROSOPHILA AND GENETIC SHIELDING DURING THE FLIGHT OF THE SPACESHIP "VOSKHOD" [RETSESSIVNYE LETALI V KH KHROMOSOME DROZOFILY I GENETICHESKAIA ZASHCHITA PRI POLETE KORABLIA "VOSKHOD"].
Ia. L. Glembotskii, G. P. Parfenov, Iu. L. Lapkin, and I. V. Baranovskaia.
Kosmicheskie Issledovaniia, vol. 5, Mar.-Apr. 1967, p. 293-297. 15 refs. In Russian.

Results of an experiment to determine the frequency of recessive lethals in the X chromosome of drosophila on board the spaceship "Voskhod" during various stages of ontogenesis. A study is made of the shielding effectiveness of 5-methoxytryptamine in reducing the frequency of recessive lethals occurring in the X chromosomes of adult male drosophila and both male and female drosophila during the embryonal and larval stages of development. It is found that the use of 5-methoxytryptamine has practically no effect on the mutation frequency in any of the experimental or control groups studied. A. B. K.

A67-27344 #
FURTHER STUDY OF THE EFFECT OF SPACE-FLIGHT CONDITIONS ON THE CHROMOSOMES OF PRIMARY EMBRYONIC RADICLES IN THE SEEDS OF CERTAIN HIGHER PLANTS [DAL'NEISHEE IZUCHENIE VLIIANIIA USLOVII KOSMICHESKOGO POLETA NA KHROMOSOMY PERVICHNYKH KORESHKOV ZARODYSHEI V SEMENAKH NEKOTORYKH VYSSHIKH RASTENII].
N. L. Delone and V. V. Antipov.
Kosmicheskie Issledovaniia, vol. 5, Mar.-Apr. 1967, p. 312. In Russian.

Results of cytological analyses of primary embryonic radicles in seeds germinating after a flight on board the spacecraft Voskhod. It is found that the conditions prevailing during the flight of this spacecraft had no significant effect on the chromosomes of the embryos of dry seeds. A. B. K.

A67-27505
LIFE SCIENCES - ADVANCED CONCEPTS.
Lorne D. Proctor (Henry Ford Hospital, Dept. of Neurology and Psychiatry; Edsel B. Ford Institute for Medical Research, Dept. of Behavioral and Neurological Sciences, Detroit, Mich.).
IN: SPACE AGE IN FISCAL YEAR 2001; AMERICAN ASTRONAUTICAL SOCIETY, GODDARD MEMORIAL SYMPOSIUM, 4TH, WASHINGTON, D.C., MARCH 15, 16, 1966, PROCEEDINGS. [A67-27501 13-34]
Edited by E. B. Konecci, M. W. Hunter, II, and R. F. Trapp.
Tarzana, Calif., American Astronautical Society (AAS Science and Technology Series. Volume 10), 1967, p. 94-104; Discussion, p. 104-113.

Commentary on the expected state of the life sciences at the beginning of the next century. Consideration is given to the ecological aspect of this field as it involves the physiology of the astronaut, with more emphasis on the neurophysiological and behavioral problems. Consciousness is a major topic. Its assessment and control through stimulation and recording at the appropriate cerebral centers, as well as such states as sleep and hibernation are discussed. Memory and learning function, decision making, and motivation are expected to be subjects of considerable interest. Orientation through the vestibular, visual, auditory, and sensory systems is treated, and the systems approach is stressed in the above functions with an attempt to relate such functions to the overall biocybernetic field. The role of molecular systems such as RNA, DNA, and enzymes as well as intracellular, extracellular, and interstitial structures are considered. The contribution of neurochemistry and pharmacology to the above systems is extrapolated to gain knowledge of their role in the future. T. M.

A67-27563
HUMAN FACTORS IN AIR TRAFFIC CONTROL DISPLAYS.
V. D. Hopkin (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
(Guild of Air Traffic Control Officers, Annual Convention, Bornemouth, England, Oct. 4-6, 1966, Paper.)
The Controller, vol. 6, Jan.-Feb. 1967, p. 4-7.

Discussion of human factors relevant to air traffic control displays. What human factors is and what it includes is described. The method by which its techniques are being applied to air traffic control problems at the moment, particularly to display problems, is indicated. Some of the probable future trends in the development of displays which are likely to become more apparent in the future are noted. M. M.

A67-27564
MEDICAL FACTORS INVOLVING AIR TRAFFIC CONTROL INFORMATION DISPLAYS.
G. Castle (Board of Trade, Civil Aviation Dept., London, England).
(Guild of Air Traffic Control Officers, Annual Convention, Bornemouth, England, Oct. 4-6, 1966, Paper.)
The Controller, vol. 6, Jan.-Feb. 1967, p. 8-10.

Discussion of medical factors of significance in air traffic control (ATC) information displays. The factors are classified as personnel, equipment, environmental, and social factors, and two examples are used to illustrate the importance of considering medical factors. The futility of planning and designing without adequate regard for the needs of the human being is stressed. M. M.

A67-27638 #
A FIXED PERCENTAGE BINARY GAS FOR LIFE SUPPORT DERIVED FROM TWO STEADY-STATE CRYOGENIC LIQUIDS.
W. J. Carter (Firewel Co., Inc., Buffalo, N.Y.).
IN: ADVANCES IN CRYOGENIC ENGINEERING. VOLUME 12 - PROCEEDINGS OF THE TWELFTH ANNUAL CRYOGENIC ENGINEERING CONFERENCE, BOULDER, COLO., JUNE 13-15, 1966. [A67-27634 13-33]
Conference supported by the National Science Foundation, NSF Grant No. GK-1116.
Edited by K. D. Timmerhaus.
New York, Plenum Press, Division of Plenum Publishing Corp., 1967, p. 56-62.

Description of a true air cryogenic system. A fixed-percentage two-gas system for life support is illustrated. The liquid nitrogen and oxygen are contained separately but adjacently. When the nitrogen is held in a saturated state at a high pressure, it assumes a saturation temperature; at a correspondingly lower pressure, the oxygen may be held in a saturated state at the same temperature as the nitrogen. By proportionally withdrawing each of the liquids, they may be separately heated and mixed as warm gases at a constant volumetric percentage to produce a true air mixture. The feasibility of the system is independent of size and withdrawal rates. It is limited only to those fluids which can be held at a common temperature as saturated fluids. R. B. S.

A67-27740 #
FAA TEST PILOT TRAINING.
H. Marshall Claybourn (Federal Aviation Agency, Washington, D.C.).
Society of Experimental Test Pilots, Technical Review, vol. 8, no. 3, 1967, p. 15-17.

Discussion of the training of newly hired FAA Flight Test Pilots in the intent and administration of the regulations. The Test Pilots are initiated to the Federal Aviation Regulations (FARs) which are concerned with the entire aircraft - materials, construction, structural integrity, flying qualities, performance, etc. The course is a combination of classroom lectures, flight demonstrations, flight practice, data acquisition, data reduction, and report writing. It is limited to considering the requirements of FAR Part 23 aircraft normal, utility, and acrobatic categories - and to gliders. The aircraft used in the course include the Cessna Model 185, the Schweizer 2-22, the Lockheed T-33, and the Cessna 130. The course includes 36 hr of flight. M. F.

A67-27742 #
MAN-MACHINE COMPATIBILITY IN VERY LOW ALTITUDE FLIGHT - PHASES I AND II.
John B. Galipault and George E. Briggs (Ohio State University, Dept. of Aviation, Dept. of Aviation Psychology, Columbus, Ohio).
Society of Experimental Test Pilots, Technical Review, vol. 8, no. 3, 1967, p. 22-28.
PHS-sponsored research.

Study of two controlled field experiments on an obstruction avoidance task in a light aircraft during very low altitude flight. Empirical data were sought to determine the relative compatibility of the pilot and his aircraft in the very low altitude environment. To analyze the problems of obstruction avoidance, a field experiment was conducted in two phases to measure the effects of aircraft center of gravity, weight, obstruction height, level of information about the point-of-pull-up and/or elevator deflection required upon obstruction miss-distance and area under the flight path curve. The results revealed that the subjects tested employed differential strategies in execution of the avoidance maneuver for the several experimental conditions. M. F.

A67-27744 #
SOMETHING NEW IN ESCAPE EQUIPMENT.
Richard G. Thomas (Northrop Corp., Northrop Norair, Hawthorne, Calif.).
Society of Experimental Test Pilots, Technical Review, vol. 8, no. 3, 1967, p. 38-42.
Research sponsored by the Society of Experimental Test Pilots.

Discussion of improvements in escape equipment with particular emphasis on the Robertshaw helmet. This helmet was designed in an attempt to provide increased facial protection and greater retention capability at high "Q" conditions. Faceplate effects on visibility and the noise attenuation capability of the helmet are considered. The flight evaluation covered such items as fit comfort, view limitations, cockpit interference, communication capability, and faceplate/sunshield mechanical operation. M. F.

A67-27745
BAILING OUT OF A HELICOPTER.
Robert S. Decker (United Aircraft Corp., Sikorsky Aircraft Div., Pilots' Branch, Stratford, Conn.).
Society of Experimental Test Pilots, Technical Review, vol. 8, no. 3, 1967, p. 43-45.

Discussion of the optimal methods of escape from a helicopter. The problem of avoiding the rotor during ejection is examined. For the fighter type helicopter, an upward ejection coupled with the jettisoning of the rotor is thought to be most practical. The optimal conditions of escape exist when (1) the helicopter is subject to 1 g or more, (2) the helicopter is at a nominal speed, (3) the helicopter is in trimmed nose down flight or, (4) the helicopter is in a coordinated turn, and (5) a minimum of 3 sec is allowed before deploying the parachute. M. F.

A67-27863
PROVISION FOR RADIATION SAFETY IN FLIGHTS OF "VOSKHOD" AND "VOSKHOD-2" SHIPS.
Iu. M. Volynkin, V. V. Antipov, B. I. Davydov, N. N. Dobrov, M. D. Nikitin, N. F. Pisarenko, and P. P. Saksonov.
(Kosmicheskie Issledovaniia, vol. 4, July-Aug. 1966, p. 630-633.)
Cosmic Research, vol. 4, July-Aug. 1966, p. 554-557. 6 refs.
Translation.

A67-27864
BIOLOGICAL INVESTIGATIONS ON THE "VOSKHOD" AND "VOSKHOD-2" SPACE-SHIPS.
N. N. Zhukov-Verezhnikov, I. N. Maiskii, N. L. Delone, N. I. Rybakov, V. A. Kozlov, B. I. Davydov, V. V. Antipov, P. P. Saksonov, K. D. Rybakova, and G. P. Tribulev.
(Kosmicheskie Issledovaniia, vol. 4, July-Aug. 1966, p. 634-640.)
Cosmic Research, vol. 4, July-Aug. 1966, p. 558-563. 15 refs.
Translation.

A67-28034 *
THE ORGANIZATION OF SKILLED RESPONSE.
Merrill Noble and Don Trumbo (Kansas State University of Agriculture and Applied Science, Manhattan, Kan.).
Organizational Behavior and Human Performance, vol. 2, Feb. 1967, p. 1-25. 56 refs.
Grants No. AF AFOSR 62-17; No. AF AFOSR 526-64; No. NsG-606.

Discussion of a series of experiments concerned with the ways in which responses become organized. The principal parameter in most studies was stimulus coherence, and tracking tasks were used as a vehicle because graded responses permit detailed and fine-grained analyses. Both spatial and temporal coherence are used in response organization and the type of response strategy varies with degree of stimulus coherence. The effects of secondary tasks, sequence length, and task coding were also examined. (Author)

A67-28036 #
SPACE EXPLORATION BY REMOTE CONTROL.
Alfred M. Mayo (Ling-Temco-Vought, Inc., LTV Astronautics Div., Dallas, Tex.).
World Aerospace Systems, vol. 3, Apr. 1967, p. 90-92.

Discussion of space exploration by automatic, directly manned, and remote-controlled space flight systems. Automatic systems are considered to be those which are completely preprogramed, and therefore can perform only those tasks quantitatively visualized in advance, plus such variations as might be consistent with the state of self-adaptive technology at the time of implementation. Applications and limitations of remote-controlled systems are mentioned, the effects of transmission power and distance are considered, and the possibility of mutual support of manned and remote-controlled systems is investigated. It is concluded that the requirements of complex missions might be met more economically by a suitable combination of manned and remote-controlled systems than by either alone. B.B.

A67-28064 *
LIGHT AND ELECTRON MICROSCOPIC STUDY OF PRIMATE LIVER 36 TO 48 HOURS AFTER HIGH DOSES OF 32-MILLION-ELECTRON-VOLT PROTONS.
John J. Ghidoni (Baylor University, College of Medicine, Texas Medical Center, Dept. of Pathology, Houston, Tex.).
Laboratory Investigation, vol. 16, no. 2, 1967, p. 268-286. 39 refs.
Grant No. NGR-44-003-018.

Results of experiments in which rhesus monkeys were irradiated with 6000 rads of 32-Mev protons which penetrated the animals to a depth of 1 cm. The animals were rotated during exposure. During the 36- to 48-hr postirradiation period, the animals developed central nervous system irritability and other clinical signs of nerve cell damage. Morphologic observations of liver obtained by sacrifice during this interval are reported. The most prominent features of the irradiated hepatocytes were the discrete, segmental membrane alterations found focally in parts of mitochondria, rough and smooth endoplasmic reticulum, and microbodies. The remarkable increase in the shrunken, dark cell population in the irradiated portions of liver and the elevated serum enzyme levels are considered to be supporting evidence for the ultrastructural observations of membrane alterations. M.F.

A67-28065 *
PRIMARY AND SECONDARY CAROTENOIDS OF SPONGIOCHLORIS TYPICA.
Robert McLean (Connecticut, University, Dept. of Botany, Storrs, Conn.).
Physiologia Plantarum, vol. 20, 1967, p. 41-47. 28 refs.
NSF Grant No. GB-1856; Grant No. NsG(T)-47.

A qualitative and quantitative investigation was made of the pigments of Spongiochloris typica over an 8-week period. The pigments were chromatographed on thin layers of sucrose and measured spectrophotometrically. Pigments present after 1 week of growth were identified as chlorophylls a and b, β-carotene, lutein, zeaxanthin, violaxanthin, trollein, and neoxanthin. In cultures 2 weeks or more old, secondary carotenoids appeared. These were echinenone, canthaxanthin, astacene, and an unidentified ketocarotenoid. Carotenoids comprised nearly 100% of the total pigment composition on the eighth week. About 75% of the carotenoid fraction on the eighth week consisted of secondary carotenoids. (Author)

A67-28067 *
DETERMINATION OF SOIL PHOSPHATASE ACTIVITY BY A FLUORIMETRIC TECHNIQUE.
J. R. Ramírez-Martínez (Instituto Venezolano de Investigaciones Científicas, Caracas, Venezuela) and A. D. McLaren (California, University, Dept. of Soils and Plant Nutrition, Laboratory of Soil Biochemistry, Berkeley, Calif.).
Enzymologia, vol. 30, no. 4, 1966, p. 243-253. 17 refs.
AEC Contract No. AT (11-1)-34; Grant No. NsG-704.

Description of a fluorimetric technique for the determination of phosphatase activity in soils based on the measurement of β-naphthol released to the soil extract upon hydrolysis of Na-β-naphthylphosphate. A spectrographic analysis of the fluorimetric assay is used to demonstrate that the detection of β-naphthol released to the soil extract is not affected by either unhydrolyzed substrate or the soil extract in the soils tested. Retention by soil of the hydrolysis product being measured must be accounted for when the phosphatase activity of soils is expressed quantitatively. The agreement found for the pH optimum curves of Dublin soil, using either Na-β-naphthylphosphate or glycerophosphate as substrate, shows the adequacy of the technique described. The fluorimetric technique with its simple and rapid measurements can advantageously replace the long and tedious procedures required in most previous soil phosphatase assays. M.F.

A67-28210 #
MINIATURIZED MULTICHANNEL BIOTELEMETRY [MINIATURNÍ VÍCEKANÁLOVÁ BIOTELEMETRIE].
J. Hanousek, S. Blažka, and P. Kron.
International Congress of Aviation and Space Medicine, 15th, Prague, Czechoslovakia, Sept. 26-Oct. 1, 1966, Paper. 3 p. In Czech.

Description of a three-channel, multiplexed FM biotelemetry system designed for the purpose of recording the physiological condition of a pilot and thus ascertaining his efficiency of operation. The system consists of an electrocardiogram, a pneumograph, and units for measuring the technical aspects of flight. The transmitter, carried onboard, weighs 605 g and measures 140 x 135 x 40 mm. Power output is 150 mw at 108 MHz. The amplifiers, modulators, and filters contained in the transmitter package are described. The receiver is a superheterodyne using a ground-plane antenna with sensitivity better than 3 μv. Operating range without an external antenna on the aircraft is approximately 50 km. The operation of the fully transistorized decoding unit is described in detail. T.M.

A67-28211 #
SPATIAL ORIENTATION OF PILOTS [PROSTRANSTVENNAIA ORIENTIROVKA LETCHIKA].
V. A. Popov and E. M. Iuganov.
International Congress of Aviation and Space Medicine, 15th, Prague, Czechoslovakia, Sept. 26-Oct. 1, 1966, Paper. 11 p. In Russian.

Consideration of a pilot's spatial orientation, defined as his ability to determine his attitude with respect to the gravity vector and to reference points in outer space or on earth. Factors affecting the functioning of human spatial orientation systems during flights are discussed in general terms. V.Z.

A67-28212 #
ATP-ASE, 5-NUCLEOTIDASE, CATALASE, CARBOANHYDRASE, LACTIC ACID DEHYDROGENASE AND LACTIC ACID CONTENT IN RED BLOOD CELLS AFTER LONG-TERM HIGH ALTITUDE HYPOXIA.
S. Szmigielski.
International Congress of Aviation and Space Medicine, 15th, Prague, Czechoslovakia, Sept. 26-Oct. 1, 1966, Paper. 3 p.

Investigation of the changes in enzyme activities in erythrocytes after long-term high-altitude hypoxia and the influence of MICORENE on the reaction of erythropoiesis after hypoxia. It was found in experiments that MICORENE in doses of 50 or 100 mg per kg of body weight prevented death after high-altitude hypoxia; changes were seen, however, only in ATP-ase, lactic acid dehydrogenase and catalase activity and not in routine hematological tests. M.F.

A67-28213 #
EXPERIMENTAL METHOD FOR THE STUDY OF BIOLOGICAL EFFECTS OF HEAVY IONS OF PRIMARY COSMIC RADIATION ON BACTERIA [METHODE EXPERIMENTALE POUR L'ETUDE DES EFFETS BIOLOGIQUES PROVOQUES PAR LES IONS LOURDS DU RAYONNEMENT COSMIQUE PRIMAIRE SUR DES BACTERIES].
A. M. Pfister, G. Deltour, H. Atlan, and R. Kaiser.
International Congress of Aviation and Space Medicine, 15th, Prague, Czechoslovakia, Sept. 26-Oct. 1, 1966, Paper. 8 p.
In French.

Study of the mutagenic effects of cosmic radiations on the basis of observations of heavy ions in the upper atmosphere. The experimental setup consisted of plates of nuclear emulsions placed between small boxes of bacteria cultures. An experiment carried out by balloon-probes at 30,000 m is described in detail. M.F.

A67-28214 #
HEARING OF CIVIL NAVIGATION PERSONNEL ABOVE 40 [L'AUDITION DU PERSONNEL NAVIGANT CIVIL AU-DELA DE 40 ANS].
Albert Hustin (Société Anonyme Belge d'Exploitation de la Navigation Aérienne, Brussels, Belgium).
International Congress of Aviation and Space Medicine, 15th, Prague, Czechoslovakia, Sept. 26-Oct. 1, 1966, Paper. 9 p. In French.

Discussion of auditory troubles developed in flight and examination of their causes. Two factors influence the hearing of aviators - engine noise and sudden variations of atmospheric pressure. Auditory troubles discussed include barotrauma and circulatory constriction (urea, cholesterol, hepatic troubles, and sensitivity to professional stresses). It is pointed out that radio-navigators are particularly subject to auditory ailments. The need for taking preventive measures against auditory ailments is emphasized. M.F.

A67-28215 #
EJECTIONS THROUGH THE CANOPY [EJECTIONS A TRAVERS VERRIERE].
R. Auffret and H. Seris (Centre d'Essais en Vol, Laboratoire de Médecine Aérospatiale, Brétigny-sur-Orge, Seine-et-Oise, France).
International Congress of Aviation and Space Medicine, 15th, Prague, Czechoslovakia, Sept. 26-Oct. 1, 1966, Paper. 5 p.
In French.

Study showing that escape through aircraft canopies with a thickness between 6 and 9 mm does not involve serious risks for the pilot. However, with canopies 10 mm or more in thickness, the accelerations, the vertebral compressions and the impacts are at the limit of the human body's resistance. M.F.

A67-28216 #
ROLE PLAYED BY NUTRITIONAL FACTORS IN FLIGHT SAFETY [ROLE JOUE PAR DES FACTEURS NUTRITIONNELS DANS LA SECURITE DES VOLS].
M. Pingannaud and J. Fabre.
International Congress of Aviation and Space Medicine, 15th, Prague, Czechoslovakia, Sept. 26-Oct. 1, 1966, Paper. 11 p. In French.

Study of functional or reactive hypoglycemia as a potential cause of flight accidents. It is shown that the alimentary behavior of the pilot often brings about the apparition of hypoglycemic phases. The role of glucides in alimentation and their eventual influence on the psychophysiologic aptitude of the pilots are studied. The results of a questionnaire given to 446 pilots emphasize the connection between the consumption of a high percentage of hydrocarbons and the development of hypoglycemia. M.F.

A67-28217 #
SPACE IONIZING RADIATION AS A PROBLEM IN AVIATION AND SPACE MEDICINE.
Carl-Johan Clemedson.
International Congress of Aviation and Space Medicine, 15th, Prague, Czechoslovakia, Sept. 26-Oct. 1, 1966, Paper. 29 p. 61 refs.

Study of the radiations encountered during space flight and during supersonic flight within the atmosphere. Radiation doses from galactic cosmic-ray particles, geomagnetically trapped particles, solar-flare particles, and secondary radiations produced by interactions of primary particles with the materials of the flight vehicle are discussed, with attention given to SST aircraft as well as to spacecraft. The biological effects of various types and dosages of radiation are examined. Shielding methods and radiation dosimetry and warning systems for spacecraft and SST aircraft are also considered. R.B.S.

A67-28218 #
HUMAN TOLERANCE TO INFLIGHT STRESSES OF MAXIMAL INTENSITY.
J. P. Stapp.
International Congress of Aviation and Space Medicine, 15th, Prague, Czechoslovakia, Sept. 26-Oct. 1, 1966, Paper. 12 p.

Description of various deceleration experiments performed upon human beings and monkeys. Falls from assorted heights and upon different surfaces are examined, with attention given to body position during moment of impact. Experiments are reported which were designed to reproduce actual velocities and decelerations for the distances and durations of real aircraft crashes, seat ejection escape from aircraft in flight, parachute opening and landing impact, and space-cabin landing impacts. The bulk of the reported data deals with tolerable gravities and gravity accelerations as experienced by man and monkey, forces which were produced through use of the rocket sled. R.B.S.

A67-28219 #
CRITERIA FOR EMERGENCY RECOMPRESSION PROCEDURES DURING SPACE FLIGHT AS STUDIED BY THE EXPOSURE OF CHIMPANZEES TO A NEAR VACUUM.
Harald J. von Beckh.
International Congress of Aviation and Space Medicine, 15th, Prague, Czechoslovakia, Sept. 26-Oct. 1, 1966, Paper. 10 p.

Outline of decompression experiments performed upon chimpanzees in simulated outer-space environments. The subjects were decompressed from 179 mm Hg (100% oxygen) to less than 2 mm in 0.8 sec and remained at this altitude from 5 to 150 sec. After recompression to 179 mm Hg, the subjects were kept at this altitude for 24 hours. Performance by all animals, on a complex operant schedule presented during and following rapid decompression, reached a baseline level within a four-part post-decompression period. No central-nervous-system damage could be detected. Cortical EEG, ECG, and respiration were recorded before, during, and following decompression. Surgical procedures for implanting chronic cortical leads were developed. A table is given showing the results of nine experiments. R.B.S.

A67-28220 #
OUR EXPERIENCE WITH ILLUSIONS DUPLICATED IN A FLIGHT SIMULATOR [NOTRE EXPERIENCE AVEC LES ILLUSIONS IMITEES AU COURS D'UN VOL DANS LE SIMULATEUR DU VOL].
Vladimir Malčík.
International Congress of Aviation and Space Medicine, 15th, Prague, Czechoslovakia, Sept. 26-Oct. 1, 1966, Paper. 4 p. In French.

Discussion of experiments in a flight simulator designed to test the pilot's ability to disregard his senses and trust only his instruments for flight control. Sensations corresponding to flight illusions in a situation very similar to that of real flight were simulated. These sensations were provoked by exciting the vestibular apparatus by means of a galvanic current in pilots placed in the flight simulator. It is pointed out that certain pilots require a relatively long period of time to master the test. The time subjectively estimated by the pilot is much shorter than the real time necessary to reestablish the flight regime. These periods of time have a ratio of as much as 1 to 20. M.F.

A67-28221 #
INFLUENCE OF STRESS ON GLYCEMIA IN HEALTHY SUBJECTS [INFLUENCE DU STRESS SUR LA GLYCEMIE CHEZ DES PERSONNES SAINES].
M. Pípal.
International Congress of Aviation and Space Medicine, 15th, Prague, Czechoslovakia, Sept. 26-Oct. 1, 1966, Paper. 4 p. In French.

Study of the influence of different stresses on changes in the sugar content of the blood. Experiments show that prolonged fasting causes an initial lowering of the sugar content of the blood followed by a stabilization at a lower level as a result of the phase of adaptation of the organism. The intensity of the hypoglycemic symptoms is discussed, and eosinophilia in the capillary blood is studied by the Dunger method. M.F.

A67-28222 #
RADIOBIOLOGICAL ASPECTS OF RADIATION SAFETY IN COSMIC FLIGHTS [RADIOBIOLOGICKÉ ASPEKTY RADIAČNÍ BEZPEČNOSTI KOSMICKÝCH LETŮ].
Yu. G. Grigorijev and E. E. Kovalev.
International Congress of Aviation and Space Medicine, 15th, Prague, Czechoslovakia. Sept. 26-Oct. 1, 1966, Paper. 6 p. In Czech.

Evaluation of factors responsible for radiation doses absorbed by the crew of spacecraft, including a discussion on radiation belts and solar and cosmic radiation. Radiation absorbed in long-term space flights is analyzed in relation to maximum tolerable radiation doses. Some of the criteria and methods of determining the effects of gradual radiation doses on humans are discussed. Individual sensitivity to radiation is stressed in relation to the importance of considering this factor in crew member selection. Local physical protection against radiation is described in relation to various parts of the human organism. Effects of radiation on life-sustaining plants are evaluated. Test results of various experiments are cited and radiation values for different effects are given. T.M.

A67-28223 #
BALLISTOCARDIOGRAPHIC ANALYSIS, DUAL MASTEROV EXAMINATION, AND GLUCOSE STUDY OF MIDDLE-AGED PILOTS - EVALUATION OF THE TESTS AND COMPARISON WITH CLINICAL RESULTS [BALISTOKARDIOGRAFICKÉ VYŠETŘENÍ, DVOJITÁ MASTEROVA ZKOUŠKA A ZKOUŠKA S GLUKOSOU U PILOTŮ STŘEDNÍHO VĚKU - VALIDITA ZKOUŠEK A SROVNÁNÍ S KLINICKÝM NÁLEZEM].
J. Moučka and Vl. Horáček.
International Congress of Aviation and Space Medicine, 15th, Prague, Czechoslovakia, Sept. 26-Oct. 1, 1966, Paper. 6 p. In Czech.

Evaluation of the efficiency of ballistographic, glucose, and Masterov methods of examination of pilots for the purpose of diagnosing coronary defects, effects of excess weight, and circulatory disorders. One hundred twelve pilots aged from 36 to 51 years were tested using these methods. The largest number of physical disorders was registered by ballistographic tests; the test results were found to be in agreement with clinical diagnoses. Positive results of the efficiency of tests were found to occur in greater frequency at higher age levels. Glucose tests proved to be an efficient method of determining arterial weakening. The Masterov analysis was often found to be debatable for younger pilots. The tests have demonstrated the necessity of devoting greater attention to coronary disorders among older pilots. T.M.

A67-28224 #
TEMPORARY IRRITATION BY ANTI-G AND THE CHANGE IN THE VESTIBULAR-MOTOR REFLEX ACTION UNDER LABORATORY CONDITIONS [TAKTILNÍ PODRÁŽDĚNÍ ANTI-G ODĚVEM A ZMĚNA VESTIBULOMOTORICKÉ REFLEXNÍ AKTIVITY V LABORATORNÍCH PODMÍNKÁCH].
Zdeněk Novotný.
International Congress of Aviation and Space Medicine, 15th, Prague, Czechoslovakia, Sept. 26-Oct. 1, 1966, Paper. 2 p. In Czech.

Examination of the effects of temporary irritation of the vestibular nerve (experienced by pilots during flight) on the pilot's ability to orient himself. Experiments were conducted which consisted on applying a temporary irritation to the vestibular nerve by changes in gravity and subsequent testing of reflexive reactions by means of an applied electric current. The results indicate marked reactions in some of the tested persons consisting of decreased reflex-action sensitivity after applied gravitational changes. It is concluded that the changes in gravity occurring during flight may have a significant effect on the pilot's capabilities. T.M.

A67-28225 #
PRESSURIZED BREATHING AND AUTONOMOUS REGULATION [PŘETLAKOVÉ DÝCHÁNÍ A AUTONOMNÍ REGULACE].
J. Svačinka and J. Luxa.
International Congress of Aviation and Space Medicine, 15th, Prague, Czechoslovakia, Sept. 26-Oct. 1, 1966, Paper. 4 p. In Czech.

Examination of the effects of breathing pure oxygen under pressure on the autonomous systems of the human body. Studies involved the effects of pressurized breathing with and without external compensation on the pulse rate and variations in systolic and diasystolic pressures. Malfunctions of the nervous, respiratory, and circulatory systems are analyzed in detail and their relative dependence on each other is described. Three types of experiments with pressurized breathing were performed. They consisted of: (1) breathing without external compensation; (2) breathing with external compensation limited to the body or the extremities only; and (3) total external pressure compensation. The effects of partial and total compensation are discussed. Breathing under pressure is further examined as a function of the trophotropic systems of the organism. T.M.

A67-28226 #
REMARKS ON THE POSSIBILITY OF DETERMINING AFTER THE FACT THE PSYCHOLOGICAL STATE OF A PILOT DURING AIRCRAFT COLLISIONS [POZNÁMKY K MOŽNOSTI POSOUZENÍ PSYCHICKÉHO STAVU PILOTA POST HOC PŘI LETECKÝCH KATASTROFÁCH].
F. Vorel and Z. Zemanová.
International Congress of Aviation and Space Medicine, 15th, Prague, Czechoslovakia, Sept. 26-Oct. 1, 1966, Paper. 4 p. In Czech.

Examination of the sugar content of the bodies of deceased pilots for the purposes of determining whether the pilot was conscious or not directly prior to a collision, whether he maintained control of the aircraft, and whether he was aware of an imminent catastrophy. Thirty-three cases of instantaneous death resulting from aircraft collisions were examined by analyzing the sugar content of the liver. Further work entailed reconstruction of the critical moments of flight by comparison of saccharide and glucose content with other relevant facts of the collisions. Three distinct situations were examined: (1) cases in which the pilot had no prior knowledge of the imminent crisis; (2) cases in which the pilot was only momentarily aware of the impending collision; and (3) situations such as those caused by meteorological and technical conditions which resulted in a prolonged nervous state. Results of the study are discussed in detail and it is concluded that postmortem examination is a useful method in reconstructing aircraft collisions. T.M.

A67-28227 #
SIGNIFICANT MEANING OF THE X-RAY EXAMINATION OF PILOTS' ARMS AFTER AIRCRAFT COLLISIONS [EXPERTIZNÍ VÝZNAM RTG VYŠETŘOVÁNÍ RUKOU PILOTŮ PŘÍ LETECKÝCH KATASTROFÁCH].
Josef Volek.
International Congress of Aviation and Space Medicine, 15th, Prague, Czechoslovakia, Sept. 26-Oct. 1, 1966, Paper. 4 p. In Czech.

X-ray examination of the arms of pilots killed in aircraft collisions for the purposes of describing the mechanisms of forces resulting in bone injuries and ascertaining the degree of control exercised by the pilot directly prior to the catastrophe. X-ray studies were made of the arms of pilots of M-15, commercial, and sports aircraft. The positions of the arms which were of primary concern in the study consisted of: (1) hands grasping the control instruments;

(2) hands braced against the control panel; and (3) arms positioned in a passive, relaxed manner. The X rays revealed that the largest number of bone fragments occurred in hands strained against the control instruments. The distribution of these fragments throughout the soft tissue was studied extensively together with the positions of fractures. Considerable difference of damage between the left and right arms of pilots attempting control in the last moments of flight are discussed. Injuries incurred by inactive pilots, both conscious and unconscious, are also discussed. T.M.

A67-28480 *

CIRCADIAN SYSTEM PHASE - AN ASPECT OF TEMPORAL MORPHOLOGY - PROCEDURES AND ILLUSTRATIVE EXAMPLES.

F. Halberg, Y. L. Tong, and E. A. Johnson (Minnesota, University, Dept. of Pathology and Bio-Medical Data Processing Unit, Minneapolis, Minn.).

IN: THE CELLULAR ASPECTS OF BIORHYTHMS; INTERNATIONAL CONGRESS OF ANATOMY, 8TH, SYMPOSIUM ON RHYTHMIC RESEARCH, WIESBADEN, WEST GERMANY, AUGUST 8-14, 1965, PAPERS.
Berlin, Springer-Verlag, 1967, p. 19-48. 25 refs.
Grant No. NsG-517.

Description of tests designed for the detection of circadian (approximately 24-hr) rhythms and the estimation of the parameters involved. The so-called cosinor procedure for detecting circadian rhythms and for objectively and quantitatively describing their amplitude and phase is thoroughly discussed. In the complete cosinor diagram, a directed line shows by its length the amplitude and by its angle the phase of the rhythm in a given sample. The confidence region corresponding to the pair of parameters concerning amplitude and phase is shown in this diagram as an error ellipse. A rhythm is isolated by this procedure if the error ellipse does not overlap the pole of the polar plot. For a rhythm thus detected, the ellipse also serves for deriving a confidence interval of the amplitude and a confidence arc of the phase. R. B. S.

A67-28588 *

METABOLIC CHANGES IN RATS EXPOSED TO AN OXYGEN-ENRICHED ENVIRONMENT.

A. D. Bond, John Patrick Jordan, and John B. Allred (Oklahoma City University, Dept. of Chemistry, Oklahoma City, Okla.).

American Journal of Physiology, vol. 212, Feb. 1967, p. 526-529. 23 refs.
Grant No. NsG-300.

Male Holtzman rats were maintained in an oxygen atmosphere at 259 mm Hg for periods as long as 90 days. Acetylative capacity of tissues (coenzyme A concentration) was observed to decrease during the first 4 to 5 weeks to approximately 50% of control values. Longer exposure resulted in restoration of normal activity. Incorporation of (^{14}C) acetate into lipid was seen to decrease and reapproach normal in a parallel manner. Conversion of (^{14}C) acetate to $^{14}CO_2$ also was found to decrease during initial exposure and later reapproach normal. (Author)

A67-28660

A STUDY AND REVIEW OF HUMAN RESPONSE TO PROLONGED RANDOM VIBRATION.

Richard J. Hornick and Norman M. Lefritz (North American Aviation, Inc., Los Angeles, Calif.).

Human Factors, vol. 8, Dec. 1966, p. 481-492. 12 refs.

This article describes a study conducted to determine the effects of long duration, random vibration - characteristic of low-altitude high-speed (LAHS) flight aircraft - on human performance, physiological, biodynamic, and tolerance responses. Ten subjects experienced 0.10, 0.15, and 0.20 g rms with a shaped power spectral density from 1 to 12 cps while engaging in LAHS control tasks. Simulation runs were of 5 hours duration, with the centermost 4 hours under dynamic conditions. Results of this experiment are related to those of other studies which had the same general objectives in order to provide a brief review and summary about what is known regarding human capabilities for LAHS flight. (Author)

A67-28661

PANEL LAYOUT FOR RECTILINEAR INSTRUMENTS.

Robert W. Bauer, Robert K. Cassatt, Bernard M. Corona, and Frank Warhurst, Jr. (U.S. Army, Human Engineering Laboratories, Aberdeen Proving Ground, Md.).

Human Factors, vol. 8, Dec. 1966, p. 493-497. 8 refs.

Rectilinear dials on a typical cockpit display were arranged in parallel, both horizontally and vertically, and also in a mixed, orthogonal arrangement. Although, intuitively, the parallel layouts appeared advantageous, the mixed layout yielded the best detection accuracy and the shortest detection times. Increasing the spacing between groups within a parallel, vertical array did not significantly improve performances. Uniform scales in any arrangement proved superior to nonuniform scales in readout accuracy. Thirty-six pilots and sixteen technical and scientific laboratory personnel participated in the study. Performances of pilots and nonpilots were very similar. (Author)

A67-28662 *

PERCEPTUAL NARROWING IN NOVICE DIVERS.

Gershon Weltman and Glen H. Egstrom (California, University, Los Angeles, Calif.).

Human Factors, vol. 8, Dec. 1966, p. 499-506. 22 refs.
Grant No. NsG-237-62.

It was hypothesized that in diving, danger-induced stress may contribute to performance decrement by narrowing perceptual scope. A study was conducted to examine the effect of task load and type of underwater exposure on response time to a signal light in the visual periphery. Novice divers monitored a peripheral light alone, or while simultaneously performing a central addition or dial-watching task. Each subject was tested on the surface, in a diving tank, and in the open ocean. It was found that the central tasks did not interfere with peripheral vigilance on the surface. During diving, a distinct subgroup of the dual-task subjects exhibited markedly increased response times to the peripheral light while maintaining near constant performance on the central tasks. Their behavior appeared more closely related to diving risk than to other environmental factors. The remaining dual-task subjects, and the light alone group, were almost uneffected by underwater exposure. The hypothesis was considered partially validated. (Author)

A67-28663 *

DISPLAYS FOR SEEING WITHOUT LOOKING.

Leroy L. Vallerie (Dunlap and Associates, Inc., Darien, Conn.).

Human Factors, vol. 8, Dec. 1966, p. 507-513. 21 refs.
NASA-sponsored research.

A laboratory study was conducted to determine the effectiveness of peripheral vision displays for presenting dynamic tracking information during difficult control tasks such as landing high speed aircraft or rendezvousing spacecraft. It was hypothesized that peripheral displays could be successfully used to improve performance provided visual switching between information sources is normally an essential part of such tasks. Visual switching consists of eye movement, accommodation, and convergence. The hypothesis was tested by comparing the performance on a two-dimensional compensatory tracking task under conditions in which the requirements for visual switching and the provisions of peripheral displays were systematically varied and controlled. The study clearly demonstrated that tracking performance deteriorates as visual switching increases and that peripheral displays can be used to overcome its adverse effects. (Author)

A67-28664 *

THE EFFECTS OF VALUES AND COSTS ON THE DETECTION AND IDENTIFICATION OF SIGNALS IN AUDITORY VIGILANCE.

Jerrold M. Levine (Massachusetts, University, Amherst, Mass.).

Human Factors, vol. 8, Dec. 1966, p. 525-537. 17 refs.
Grant No. NsG(T)-137.

The effects on performance of the value of detecting a signal, the cost of a miss or false detection, and the size of the set from which the signals were drawn were studied in an auditory vigilance

task. Seventy-two subjects were randomly assigned to each cell of a factorial arrangement of the cost and load variables and required to detect and identify each of several 49 db SPL (sound pressure level) pure tones differing only in frequency. Analyses of the number of correct detections, correct identifications, false detections and detection response time indicated a significant performance decrement with time for all measures and suggested that increasing costs for misses and false detections led to poorer detection performance while value had no effect. Load effected only identification performance, as higher loads led to a decrease in the percentage of signals correctly identified. The d' and β statistics of signal detection theory indicated sensitivity to be invariant with manipulations of costs and with time. These findings imply that the performance decrement during a vigil is due to an increased strictness in the criterion the subject sets for deciding whether or not a signal was present. The cost factors were effective in manipulating performance by causing changes in the subjects' decision criteria. (Author)

A67-28665 #
CONTROL-DISPLAY ASSOCIATION PREFERENCES FOR CONCENTRIC CONTROLS.
James V. Bradley (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Wright-Patterson AFB; Antioch College, Behavior Research Laboratory, Yellow Springs, Ohio).
Human Factors, vol. 8, Dec. 1966, p. 539-543.

Seventy-five male college students and twenty-five human-engineering psychologists were given a questionnaire presenting diagrams consisting of three concetrically ganged knobs and three dials which they were told the knobs operate. They were asked which dial they thought should be operated by each of the three knobs. Knob-dial associations were obtained with dials in horizontal and vertical arrays above, below, to the left of, and to the right of the knobs, and with dials differing in size, shape and distance from the knob axis. Knob-dial associations were found to be influenced by all of these factors except dial shape. Associations which were both strong and relatively unrivaled were found for dial position in a horizontal array (except when the array is to the left of the knobs), and for dial size. Subjects associated the spatial knob progression, front knob to back knob with the spatial dial progression, left dial to right dial and with the dial size progression, smallest dial to largest dial. Strong, but strongly rivaled, associations were found for dial position in a vertical array and for dial distance from the knob axis. (Author)

A67-28666 *
BIOMEDICAL CONSIDERATIONS OF POSSIBLE DECOMPRESSION EFFECTS IN A SUPERSONIC TRANSPORT.
Jerry A. Emery, Alan A. Burrows, and Douglas R. Collier, Jr. (Douglas Aircraft Co., Inc., Long Beach, Calif.).
Human Factors, vol. 8, Dec. 1966, p. 545-561. 21 refs.
NASA-supported research.

The possible consequences of the event of a supersonic transport cabin decompression are discussed in terms of biomedical considerations for passengers. Recent data concerning health and age-sex distributions are reviewed in an effort to derive a model group likely to be encountered among future supersonic transport flights along both transcontinental and transatlantic routes. Further consideration is directed to an analysis of various disease groups in terms of functional impairment as a means of anticipating passenger safety during cabin decompression. The results have been used to establish a basis for safety equipment design recommendations. Finally, attention is directed to research areas and methodology by which usable statistics might be obtained to provide further clarification of the tolerance ranges of debilitated humans. (Author)

A67-28667
INDEPENDENT EFFECTS OF ERROR MAGNIFICATION AND FIELD OF VIEW ON COMPENSATORY TRACKING PERFORMANCE.
Russell L. Smith (California, University, Los Angeles, Calif.; Dunlap and Associates, Inc., Darien, Conn.), David R. Garfinkle, and John Lyman (California, University, Los Angeles, Calif.).
Human Factors, vol. 8, Dec. 1966, p. 563-567. 16 refs.
Contract No. N-123(60530)-23558A.

This experiment evaluated the independent effects of error magnification and field of view on compensatory tracking performance. Both display and optical magnification were investigated. In general, the results demonstrated that: (1) the facilitative effect on performance of display magnification was primarily due to the concomitant field of view reduction and not magnification per se; (2) optical magnification facilitated performance but subsequent display gain increases had no further affect; (3) regardless of visual mode employed, optimum performance levels on a complex trajectory converged at approximately the same field of view. It was suggested that increasing the optical gain or decreasing the field of view resulted in subjects reducing their reaction times to target movements. No evidence was found which indicated that magnification facilitated visual perception. (Author)

A67-28668
THE INFLUENCE OF AN INTERMITTENT VISUAL STIMULUS ON PERCEPTUAL MOTOR SKILLS IN AVIATION.
Ross E. Ailslieger and R. Dale Dick (North American Aviation, Inc., Los Angeles, Calif.; Wisconsin State University, Eau Claire, Wis.)
Human Factors, vol. 8, Dec. 1966, p. 569-572. 9 refs.

The effect of a light flashing at 5 flashes/sec on performance of tasks representative of those required of a pilot was studied. The tasks were digit span, pursuit rotor, reaction time, and a combination of all three. Reaction time was longer in the combined task, and pursuit rotor performance was degraded by the flashing light. It was concluded that the longer reaction times were due to lowered vigilance, and the degradation of pursuit rotor performance was attributed to interference in the central processes by the flashing light. (Author)

A67-28669
CONTROL OF A REMOTE MANEUVERING UNIT DURING SATELLITE INSPECTION.
Herbert J. Clark (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio).
Human Factors, vol. 8, Dec. 1966, p. 573-582.

Operator performance in flying a simulated remote maneuvering unit (RMU) on a coplanar satellite inspection mission was evaluated under two conditions of RMU attitude control and two conditions of cockpit instrumentation. The maneuver was repeatedly performed successfully using either an on-off acceleration-command attitude control system or an on-off rate-command attitude control system, each with either a full panel of cockpit instruments (six) or only one cockpit instrument. The rate-command system was found to be superior for pitch control during station keeping and for roll control in general. The acceleration-command system was superior for pitch control during the trajectory portions of the mission. Because both control systems had disadvantages, investigation of a variable rate-control system is recommended. More economical and precise RMU control was obtained under the full-panel cockpit instrumentation condition irrespective of the control system used. The instruments of most value were found to be those which provided X (longitudinal) and Z (vertical) distance information. The limitations of the simulation and the advantages and disadvantages of an "inside-out" vs an "outside-in" television display of the target and its surrounds are also discussed. (Author)

A67-28688 #
A NEW VERSATILE MINIATURE MULTI-CHANNEL PERSONAL TELEMETRY SYSTEM FOR MEDICAL RESEARCH.
A. Marko, A. T. Kissen (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Environmental Medicine Div., Wright-Patterson AFB, Ohio), R. H. Murray (Indiana, University, Cardiopulmonary Laboratory, Bloomington, Ind.), and D. M. McGuire (Dayton, University, Research Institute, Dayton, Ohio).
IN: NTC 67; PROCEEDINGS OF THE 1967 NATIONAL TELEMETERING CONFERENCE, SAN FRANCISCO, CALIF., MAY 16-18, 1967. [A67-28679 14-07]

Conference sponsored by the American Institute of Aeronautics and Astronautics, the Instrument Society of America, and the Institute of Electrical and Electronics Engineers.
New York, American Institute of Aeronautics and Astronautics, Inc., 1967, p. 152-156. 8 refs.
Contracts No. AF 33(615)-2922; No. AF 33(615)-2182.

Description of a miniaturized, 7-channel, pulse-duration-modulated and multiplexed, personal radio-telemetry unit developed for medical monitoring of subjects during work, vigorous exercise, and exposures to environmental stresses. The described laboratory model transmits three electrocardiographic leads, body temperature, expired airflow, and oxygen partial pressure. Since the multiplexer requires only 20 mv for full modulation, other kinds of physiological measurements such as blood pressure, skin resistance, and temperatures may be monitored without the need of preamplifiers. Transmission range is approximately 90 m and power consumption 220 mw. The unit is contained in two packets. Packet A contains signal conditioners and the multiplexer, measures 12 x 10 x 4 cm, and weighs 409 g. Packet B holds batteries for 30 hr of continuous operation and the transmitter, measures 10 x 6 x 4 cm, and weighs 322 g. Circuit diagrams and operation of the unit are analyzed.

T.M.

A67-28732 #
LIFE SUPPORT FOR INNER AND OUTER SPACE VEHICLES - SIMILARITIES AND DIFFERENCES.
Thomas V. Bolles and Harold Wallman (General Dynamics Corp., Electric Boat Div., Groton, Conn.).
American Institute of Aeronautics and Astronautics, and Society of Naval Architects and Marine Engineers, Advance Marine Vehicles Meeting, Norfolk, Va., May 22-24, 1967, Paper 67-364. 9 p.
Members, $0.75; nonmembers, $1.50.

Comparison of life-support systems for inner- and outer-space vehicles. Discussed are: oxygen supply, carbon dioxide removal, trace contaminant removal, temperature/humidity control, and water/waste/food management. For submarines minimum equipment volume is the most important factor, while in the case of space vehicles weight and power are usually the controlling criteria, as well as ability to perform under weightlessness conditions. A comparison shows that there are many similarities in the life-support systems of inner- and outer-space vehicles. Deep-diving research submarines have the greatest similarity to spacecraft, in that both types of vehicles are usually weight-critical and have a small crew, low volume-to-man ratio, and low power availability. P.v.T.

LC ENTRIES

A67-81111
BEHAVIOR OF THE CARDIOPULMONARY SYSTEM, AND SKELETAL MUSCLE STRENGTH DURING EXERCISE UNDER VARIOUS DEGREES OF OXYGEN CONTENT OF THE AIR [DAS VERHALTEN DES KARDIO-PULMONALEN SYSTEMS UND DER SKELETTMUSKELKRAFT BEI BELASTUNGEN UNTER VERSCHIEDENGRADIGEM SAUERSTOFFGEHALT DER LUFT].

W. Hollmann and H. Venrath (Med. U. Klin., Deut. Sporthochschule, Inst. für Kreislaufforsch. and Sportmed., Cologne, West Germany).

Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1 2, 3, 1966, p. 27–34. In German.

In 53 male subjects cardiac function, respiration, metabolism and strength of the skeletal muscles were examined by spiro-ergometric methods and under an oxygen content of 100, 21, 15 and 12%. No reduction of the working capacity in performances similar to sprints and runs of medium distance was observed under an oxygen content of 15%, which is equivalent to that of Mexico City. The working capacity was only reduced in performances over two min. When the air contained 15% O_2, the maximum O_2-intake was reduced by 5–15%. The energy consumption for ventilation was considerably higher. The problem of training under lack of O_2 was of special interest. After six weeks training of four to five times, ten min. a day under 12% O_2 in the inspiration air, an increase of the maximum working capacity resulted which was not statistically significant.

A67-81112
MAXIMUM PERFORMANCE CAPACITY AT SEA-LEVEL AND AT MODERATE ALTITUDE BEFORE AND AFTER TRAINING AT ALTITUDE.

B. Balke (Wis. U., Madison), J.-A. Faulkner (Mich. U., Ann Arbor), and J.-T. Daniels (Oklahoma City U., Okla.).

Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1, 2, 3, 1966, p. 106–116. 7 refs.

Discussions are presented of studies investigating maximum performance capacity at sea level and at moderate altitude before and after training at altitude. These studies suggest that physical training at elevations of about 2,300 m. is more effective than training at elevations above 3000 m. They also suggest that intermittent periods of training at lower and higher elevations result in achieving outstanding performances. Although there is no reason to assume that an athlete in peak condition for record performance should not be able to gain another slight improvement through the physiological consequences of intermittent altitude training, only actual experiments with top athletes can provide a satisfying answer to such a logically raised question.

A67-81113
METABOLIC INVESTIGATION OF ATHLETES DURING WORK LOADS ON A BICYCLE ERGOMETER AT MEDIUM ALTITUDE [STOFFWECHSELUNTER-SUCHUNGEN BEI TRAINIERTEN WAHREND FAHRRADERGOMETER-BELASTUNG IN MITTLERER HOHE].

A. Drews (U. Münster, Inst. für Sportmed., West Germany).

Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1, 2, 3, 1966, p. 88–97. 10 refs. In German.

A change in oxygen pressure from one corresponding to sea-level to one corresponding to an altitude of 2,300 m. brings a decrease of the aerobic work capacity of about 10–15% and prolonged recovery-time. A sudden change to a lack of oxygen is not strictly comparable with sports-competitions in a corresponding altitude. The factor of time must be taken into consideration when interpreting the results. The decrease of aerobic work capacity in 76 well trained athletes, however, corresponds well with the results obtained during recent sports competitions.

A67-81114
AEROBIC AND ANAEROBIC WORK CAPACITY AT 2,300 METERS.

Bengt Saltin (Kungliga Gymnastiska Centralinst., Dept. of Physiol., Stockholm, Sweden).

Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1, 2, 3, 1966, p. 81–87.

It is quite obvious that the aerobic work capacity is markedly reduced at an altitude of 2,300 m. The adaption to that altitude is slow and even after a three week stay in Mexico City the best adapted man in a group of 13 international top-athletes from Scandinavia still was 5% under his sea level value for aerobic work capacity. The only possibility to completely avoid the unfairness in the Olympic Games at the altitude of Mexico City must be to arrange all endurance events at a lower altitude, but why not still in Mexico.

A67-81115
HEMODYNAMICS OF HEALTHY STUDENTS AT REST AND DURING DIFFERENT WORK LOADS [DIE HAEMODYNAMIK GESUNDER STUDENTEN IN RUHE UND BEI ABGESTUFTER BELASTUNG].

H. P. Gurtner, M. F. Keller, and C. Salzmann (U. Bern, Med. Klin., Switzerland).

Schweizerisch Zeitschrift für Sportmedizin, vol. 14, nos. 1, 2, 3, 1966, p. 70–80. 28 refs. In German.

Hemodynamic data of the pulmonary and systemic circulation were collected from 12 healthy students at rest and during two different work loads on a bicycle aerogmeter and in respiratory steady state. The results show that such work loads are putting heavier stress on the right ventricle than on the left one.

A67-81116
THE ROLE OF OXYGEN TRANSFER ENZYME ON HIGH ALTITUDE ACCLIMATIZATION [DIE ROLLE DER O_2-UBERTRAGENDEN FERMENTE BEI DER HOHEN AKKLIMATISATION].

L. Pircher (Fliegerärztliche Inst., Dübendorf, Switzerland).

Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1, 2, 3, 1966, p. 227–229. In German.

The relationship between the degree of oxidation of cytochrome oxidase and oxygen pressure (P_{O_2}) follows the shape of an equilateral hyperbola. This relationship was confirmed experimentally using mitochondrial preparations of rat brain and cow heart. It was also shown that an P_{O_2} of only a few mm. Hg sufficed to bring cellular respiration to its maximum value. The affinity of cytochrome oxidase to oxygen is great in non-acclimatized organisms, and an elevation yields at most only a few additional mm. Hg P_{O_2}. No increase in cytochrome oxidase capacity has yet been demonstrated in acclimatized animals. It can be assumed that modification in the enzymatic system for the transfer of oxygen hardly plays a role in high altitude acclimatization.

A67-81117
INFLUENCE OF ACUTE HYPOXIA ON HEART RATE AND ARTERIAL TENSION IN THE COURSE OF TWO INTENSITIES OF WORK [L'INFLUENCE DE L'HYPOXIE AIGUE SUR LA FREQUENCE CARDIAQUE ET SUR LA TENSION ARTERIELLE AU COURS DE DEUX INTENSITES D'EFFORT].
M. Hebbelinck, J.-J. S'Jongers, L. Lewillie, R. Bande, and M. Segers (U. Libre, Lab. de l'Effort, Bruxelles, Belgium).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1, 2, 3, 1966, p. 230–235. 8 refs. In French.

A study was performed in a low pressure chamber on the effects of medium altitude (2,300 m.) and on the extreme physical exercise under these conditions. The results show that this altitude does not change considerably the heart rate or the arterial tension. The observed modifications and the statistical significances indicate a slightly increased heart rate at 2,300 m. compared with that of sea level. The arterial tension is slightly lower at sea level. Physical conditioning at sea level seems to minimize the amount of the immediate cardio-circulatory reactions to acute moderate hypoxia and seems to improve the adaptation capacity to physical effort at medium altitude.

A67-81118
PRELIMINARY RESULTS ON THE CARDIO-VENTILATORY RECOVERY AFTER SKI RACING (ALPINE SKIING) [DONNEES PRELIMINAIRES SUR LA RECUPERATION CARDIO-VENTILATOIRE APRES COURSE DE VITESSE A SKI (SKI ALPIN)].
G. Benchetrit, J. Eteradossi, A. Gillet, H. Lemarchands, and B. Potocki (Grenoble U., Fac. de Méd., Lab. de Physiol., France).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1, 2, 3, 1966, p. 236–239. In French.

Competitive downhill ski-racing is an extreme physical stress. Determination of the heart and respiratory rates and the recovery times indicate that a downhill race of 1' 30" corresponds to a maximum performance of a 500 meter run.

A67-81119
A STUDY ON ACCLIMATIZATION TO ALTITUDE IN JAPANESE ATHLETES.
K. Asahina, M. Ikai, S. Ogawa, and Y. Kuroda (Tokyo U., School of Educ., Japan).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1,2,3, 1966, p. 240–245.

A series of experiments on altitude acclimatization were carried out on Japanese athletes in a low-pressure chamber corresponding to an altitude of 4,000 m. and in the mountains at 2,240–2,800 m. Measurements were made of blood composition, oxygen consumption, respiratory functions and cardiac functions. Younger athletes seemed to be more readily acclimatized than older ones. It was concluded that two wk. were necessary for acclimatization at medium altitude from a physiological view point, but three wk. may not be sufficient from the viewpoint of performance and endurance in sports.

A67-81120
DIURNAL VARIATIONS IN RAT BLOOD GLUTATHIONE LEVELS.
G. Calcutt (Mt. Vernon Hosp. and Radium Inst., Dept. of Cancer Res., Northwood, Middlesex, Great Britain).
Die Naturwissenschaften, vol. 54, Mar. 1, 1967, p. 120. 6 refs. Brit. Empire Cancer Campaign for Res. supported research.

Male and female rats were killed by a blow on the head and blood collected from the nostrils. Total available non-protein sulphydryl (-SH) was measured. Lack of animals prevented extending the experiments to cover a full 24 hour period, but the results obtained showed considerable fluctuations in rat blood acid soluble -SH (GSH) levels during the usual laboratory working hours. The fluctuations appeared to reside largely, if not wholly, in the erythrocytes. The causes of these fluctuations are unknown but it was found that rat erythrocytes are capable of glutathione biosynthesis. If such synthesis varied in extent during the day, possibly in relation to feeding times and the consequent supply of required amino acids, this might explain the fluctuations found in the blood GSH level.

A67-81121
THE INFLUENCE OF DEPRIVATION OF PARADOXICAL SLEEP ON GLYCOGEN CONTENT IN VARIOUS BRAIN STRUCTURES OF THE CAT.
B. B. Mršulja, Lj. M. Rakić, and M. Radulovacki (Inst. for Biol. Res., Med. School, Depts. of Biochem. and Physiol., Belgrade, Yugoslavia).
Experientia, vol. 23, Mar. 15, 1967, p. 200–201. 11 refs. Grant NIH 6X9803 and Rep. Sci. Fund, Belgrade supported research.

Cats were submitted to selective and instrumental paradoxical sleep (PS) deprivation for 96 hours before being sacrificed by quick decapitation, and the various brain regions were removed and prepared for study. The results showed that the total quantity of glycogen in PS-deprived animals was significantly decreased in Pons (Pn, 34%), caudate nucleus (Cd, 30%) and thalamus (Th, 23%). However, free glycogen was increased in PS-deprived animals in Pn (47%), Th (84%) and lateral geniculate body (GL, 84%). Bound glycogen was decreased in the majority of brain structures in the animals, i.e., Pn (46%), GL (54%), Cd (32%), Th (30%) and frontal cortex (21%). The results indicate that the fall in total glycogen in certain brain structures (Pn, Cd, Th) in PS-deprived animals primarily occurs on account of bound glycogen, while in the same structures free glycogen is increased. It appears that the structures in certain physiological states lose most of their brain glycogen reserve through the transfer of bound to free glycogen. Free glycogen maintains its high level for the purpose of more rational energetic utilization.

A67-81122
TRANSFER OF OXYGEN IN MODERATE HYPOXIA AT REST AND AT SEVERE EXERCISE.
F. Kreuzer (Nijmegen U., Dept. of Physiol., The Netherlands).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1,2,3, 1966, p. 7–15. 19 refs.

Blood gas values were compiled for an athlete performing work to his aerobic and anaerobic capacity at sea level and in various phases of exposure to moderate hypoxia. There were no indications of danger to his health. An evaluation of the limiting factors seemed to show that the sharply increasing O_2 cost of the high ventilations needed might be the most likely factor limiting performance as compared with sea level conditions.

A67-81123
CIRCULATORY AND RESPIRATORY RESPONSE TO ACUTE AND PROLONGED HYPOXIA DURING HEAVY EXERCISE.

P.-O Åstrand (Gymnastiska Centralinst., Dept. of Physiol., Stockholm, Sweden).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1,2,3, 1966, p. 16–26. 15 refs.

The effect of acute hypoxia is a decrease in aerobic work capacity, roughly proportional to the reduced oxygen content of arterial blood. The cardiac function at altitudes up to 4,000 m. seemed not to be impaired during maximal work for ten min. With a prolongation of the hypoxia the increase in the hemoglobin concentration restored the oxygen carrying capacity of the blood. However, at higher altitudes this improvement in oxygen transportation could not be fully utilized since the maximal cardiac output became lower than in controls at sea level. This reduced output is at least partly connected with a lowered maximal heart rate. The situation may be different after a prolonged stay at the altitude. The noticed limitation in aerobic work capacity may be a contribution of lung diffusion, cardiac output and the high cost of extreme pulmonary ventilation. The first days after return to sea level the viscosity of the blood was still high as was the pulmonary ventilation. The respiratory muscles therefore consumed extra oxygen. Acclimatization was suggested as a necessary procedure for participants in important sports competitions at high altitudes.

A67-81124
TIME COURSE OF ADAPTATION TO DIFFERENT ALTITUDES AT TISSUE LEVEL.
W. H. Weihe (U. Zürich, Tierzucht-Inst., Switzerland).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1,2,3, 1966, p. 177–190. 27 refs.

Acclimatization to altitude depends on various climatic factors in addition to reduced air pressure. For this reason a description of the climate during fall in Mexico City is given. Cold and low humidity, commonly factors in altitude climate, are not important in the Mexico City climate in October, when the Olympic Games take place. Therefore, reduced air pressure is the major factor to which athletes have to acclimatize. Adaptation at tissue level is the final and decisive stage of acclimatization. Increased myoglobin content and increased electron transport through the respiratory chains in the muscle tissue have been found to be the result of cellular adaptation. These changes take place within several days and are further improved by training so that maximum efficiency can be expected within a three-week period.

A67-81125
THE EFFECTS OF HIGH AND MEDIUM ALTITUDES ON MAN AT HIS ARRIVAL AND DURING THE FIRST WEEK OF HIS STAY [DIE WIRKUNG GROSSER UND MITTLERER HOHEN AUF DEN MENSCHEN BEI SEINER ANKUNFT UND WAHREND DER ERSTEN WOCHEN SEINES AUFENTHALTES].
K. Hellriegel (Cerro de Pasco Corp., Hosp. de Chulec, Med. Div., La Oroya, Peru).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1,2,3, 1966, p. 191–203. In German.

The physiological equilibrium which is disturbed when going to high altitude is normalized in most healthy persons and allows increased physical performances in daily living with continued acclimatization. In some newcomers the adaptation mechanisms stay deficient for unknown reasons. These people are forced to leave the hypoxic environment. The acute pulmonary edema of high altitude, a syndrome that has been found above 2,800 m. only, is a very severe but completely curable complication which, after regression, relapses rarely and only under severe physical stress if the individual stays at high altitude. Return to lower levels is not necessary in those cases. Variability of the readiness of the human organism to adapt to hypoxic conditions, other climatic factors and risk of severe complications suggest a very slow increase in physical performances. This holds especially true for the athlete coming from low altitude for training. Top performances of short duration at lower altitude of an athlete can be achieved at medium altitude after an adequate acclimatization period. The time needed for acclimatization for medium altitude depends on ambientual and individual factors. It is assumed that in general a time period of two weeks is sufficient for these levels. Top endurance-performances at lower altitude of an athlete living at lower levels may only be achieved at medium altitude after an acclimatization period of months or even years.

A67-81126
THE EFFECTS OF MEDIUM ALTITUDE ON EXERCISE PHYSIOLOGY.
C. H. Wyndham and W. Leary (Transvaal and Orange Free State Chamber of Mines, Appl. Physiol. Lab., Johannesburg, South Africa).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1,2,3, 1966, p. 117–123. 5 refs.

The relationship in humans between oxygen consumption and pulmonary ventilation during physical exercise at medium altitude was compared with that obtained at sea level. Pulmonary ventilation was markedly increased at altitude (1,760 m.). It was estimated that a man running at sea-level with an oxygen intake of 4.0 1./min. will have a pulmonary ventilation of 100 1./min. At medium altitude, the same pulmonary ventilation would give an oxygen consumption of only 3.0 1./min. There is indirect evidence that increased pulmonary ventilation at medium altitude decreases the maximum oxygen intake.

A67-81127
VISIBILITY OF RED, GREEN, AMBER AND WHITE SIGNAL LIGHTS IN A HIGHWAY SCENE.
Merrill J. Allen, Jerald Strickland, and Anthony J. Adams (Ind. U., Div. of Optometry, Bloomington).
American Journal of Optometry and Archives of American Academy of Optometry, vol. 44, Feb. 1967, p. 105–109. 5 refs.
Grant PHS AC 00186 and Am. Optometric Found. supported research.

Under simulated driving conditions a total of 1,200 observations were made in a signal detection task designed to show any greater visibility for either green, red, white or amber signal lights. The intensity of each color was kept the same. Reaction times were measured, but no evidence was found to support current speculations that red and amber are more visible. None of the data support reduced signal luminance because of color. Stimulus intensity appeared to be the controlling factor and not color.

A67-81128
INVOLUNTARY EYE MOVEMENTS OCCURRING DURING FIXATION: EFFECTS OF CHANGES IN TARGET CONTRAST.

Ralph P. Carifa and Frederick W. Hebbard (Ohio State U., School of Optometry, Columbus).
(Am. Acad. of Optometry, Ann. Meeting, Columbus, Ohio, Dec. 14, 1964).
American Journal of Optometry and Archives of American Academy of Optometry, vol. 44, Feb. 1967, p. 73–90. 19 refs.
Ohio Lions Res. Found. supported research.

The involuntary eye movements occurring during attempted steady monocular fixation were photographed for nine different contrast levels of a fixation target, using an optical level method involving a small plane mirror attached to a contact lens. It was found that (1) as the contrast of the fixation target was decreased below 50%, there was an increase in the mean amplitude of saccades and in the standard deviation of the eye position during fixation. The increase in amplitude was shown to be highly significant statistically. (2) For target contrasts between 50 and 100%, the mean amplitude of saccades and mean standard deviation of eye position do not change with contrast. (3) There is a small and less consistent increase in frequency of saccades as target contrast increases. (4) Standard deviation of eye position may be used interchangeably for some purposes with amplitude of saccades in evaluating eye movements during fixation. The former measure can lead itself more readily to electronic analysis, which may facilitate the investigation of the effects of various variables on eye fixation.

A67-81129
EXERCISE LIMITATIONS AT INCREASED ALTITUDES.
John B. West (Postgraduate Med. School, Clin. Respirat. Physiol. Res. Group, London, Great Britain).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1,2,3, 1966, p. 149–154.

Exercise as affected by increased altitudes was measured on the Himalayan Scientific and Mountaineering Expedition of 1960–1961. A considerable degree of acclimatization occured in the subject. Changes which occurred when the work level was increased by pedalling a stationary bicycle are described and discussed. The way in which arterial oxygen saturation falls as the exercise level is increased is also described. Any reduction of the oxygen tension of inspired air will considerably handicap the diffusion ability of the lung. This is because oxygen moves across the blood-gas barrier at a rate which depends on the difference of partial pressures between alveolar gas and pulmonary capillary blood. Thus any reduction of the oxygen tension of alveolar gas caused by the inhalation of air at low pressure must reduce the rate of movement of oxygen across the alveolar membrane. If the level of exercise is sufficiently high, the result will be arterial hypoxemia and an inevitable limitation of work capacity.

A67-81130
CONTROL OF PERFORMANCE CAPACITY AT LOW PRESSURE OR OXYGEN DEFICIENCY [ZUR KONTROLLE DES LEISTUNGSVERMOGENS IM UNTERDRUCK ODER BEI O_2-MANGEL].
A. Koch (Clemenshosp., Münster, West Germany).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1,2,3, 1966, p. 98–105. 20 refs. In German.

Data regarding working capacity under reduced O_2 pressure are discussed. If subjects are well trained and acclimatized, an altitude of 2,300 m. should not present any special risk. Contrary to experiments in low-pressure chambers or during an ascent by train, physical work is performed in coordination of all functions, and the critical threshold will hardly be exceeded. During long-time performances, especially marathon-runs, the competitor should be watched for uncommon behavior (irregular walking, wavering, incoordinate movements). The long-time competitor contracts important physical and chemical oxygen debts, the compensation of which requires a considerable length of time. Exhausted athletes should be carefully watched and taken care of. Oxygen breathing may shorten the recovery time. During long-time competitions in Mexico City, oxygen respirators should be available, and ambulances on the Marathon track should be equipped with them. A helicopter service with movable respirators is recommended.

A67-81131
LOCAL CHANGES OF ATP AND PHOSPHORYLCREATINE IN HUMAN MUSCLE TISSUE IN CONNECTION WITH EXERCISE.
Jonas Bergström (St. Erik's Hosp., Renal Clin. and Center Lab., Stockholm, Sweden).
Circulation Research, vol. 20, Suppl. 1, Mar. 1967, p. I-91–I-96; discussion, p. I-97–I-98. 10 refs.

Needle biopsies were performed in the quadriceps femoris muscle of normal subjects at rest and in connection with work on a bicycle ergometer. Phosphorylcreatine (PC) and adenosine triphosphate (ATP) were determined in the biopsy material by enzymatic methods. The PC concentration was found to decrease rapidly during the first two min. of continuous work, then remained at a relatively constant level. The resynthesis of PC after work is complete within a few min. It has been demonstrated that a reverse relationship exists between the work load and the PC concentration in the muscle during work. At very high work loads, the PC concentration decreases rapidly down to zero, and the contractive capacity of the muscles ceases. When the glycogen store is considerably decreased, the PC level at work is lower than when work with the same load is carried out with the glycogen store intact. A small decrease in the ATP concentration also takes place during the first min. of work. At heavy work, when the PC level is near zero, the ATP decreases to approximately 60% of the basal value.

A67-81132
PHYSIOLOGICAL ROLE OF MUSCLE GLYCOGEN IN MAN, WITH SPECIAL REFERENCES TO EXERCISE.
Eric Hultman (St. Erik's Sjukhus, Clin. Lab., Stockholm, Sweden).
Circulation Research, vol. 20, Suppl. 1, Mar. 1967, p. I-99–I-112; discussion, p. I-112–I-114. 21 refs.

The glycogen content of the quadriceps femoris muscle is stable during the day, when no strenous exercise is performed. During heavy muscular work, a continuous decrease in glycogen in the working muscle groups was seen, the concentration being unchanged in resting muscle. The glycogen consumption per unit of time was greater in part of exercise; it then diminished successively with time. From the studies of the glycogen resynthesis after depletion, it is concluded that a factor localized to the depleted muscle cells is responsible for the enhancement of glycogen synthesis. This factor, which is in operation for several days after exercise, caused a rapid synthesis of glycogen to values far above the normal range when carbohydrate-rich diets were given. Fasting, or a carbohydrate-free diet, on the other hand, produced very slow and incomplete restoration of the glycogen content. This indicates that calories other than carbohydrates are poor precursors for glycogen formation in muscle tissue. From the studies of muscle potassium before and after exercise, and from

measurements of muscle potassium at different glycogen levels, it is concluded that the slight decrease in muscle potassium during exercise is closely correlated with the decrease in glycogen content.

A67-81133
REGULATION OF BREATHING IN EXERCISE.
D. J. C. Cunningham (U. Lab. of Physiol., Oxford, Great Britain).
Circulation Research, vol. 20, Suppl. 1, Mar. 1967, p-122–I-131. 47 refs.

Experimental results and discussions covering various aspects of the regulation of breathing in exercise are presented. The following are included: (1) Neural stimuli, (2) fast and slow changes in ventilation, (3) interaction between fast and slow components, (4) mixed venous blood receptors, (5) oscillations in arterial blood gas pressures, and (6) hypoxia and breathing in exercise. Different views of the mechanisms involved in these areas are also presented.

A67-81134
PULMONARY DIFFUSION AS A LIMITING FACTOR IN EXERCISE STRESS.
Robert L. Johnson (Tex. U., Southwestern Med. School, Dept. of Internal Med., Pauline and Adolph Weinberger Lab. for Cardiovascular Res., Dallas).
Circulation Research, vol. 20, Suppl. 1 Mar. 1967, p I-154–I-160. 29 refs.
Grants PHS HE-07744 and PHS HE-06296.

From measurements of pulmonary capillary blood volume and membrane-diffusing capacity for CO, the limits which diffusing capacity should impose on oxygen transport during heavy exercise at different altitudes was estimated. As a normal individual climbs about 5,000 feet, diffusion should become increasingly important as a factor limiting the rate of oxygen delivery to tissues during heavy exercise. During acclimatization the maximal oxygen consumption should increase partly because of an increase in alveolar oxygen tension and partly because of an increase in the oxygen-carrying capacity of the blood; however, above 10,000 feet the predicted improvement from acclimatization fails to occur. There is a striking lack of experimental data in certain important areas of exercise physiology at altitude which are necessary either to refute or confirm the theoretical calculations which were presented. It is not known what effect either acute or chronic hypoxia has on maximal cardiac output. The effects of polycythemia on the distribution of blood flow either in the lungs or in peripheral tissues are not known. Data on alveolar oxygen tensions and CO_2 tension during peak exercise at altitude are fragmentary. Few well-controlled studies have been done to define the effects of acclimatization on maximal oxygen consumption. The answers to many of these questions will have importance not only to the physiologist, but also to the clinician who is interested in knowing under what circumstances polycythemia causes impairment of circulation or gas exchange and what effects chronic hypoxia has on the pulmonary vascular bed and on the heart.

A67-81135
EXERCISE AND THE REGULATION OF VENTILATION.
Erling Asmussen (Copenhagen U., Lab. for Theory of Gymnastics, Denmark).
Circulation Research, vol. 20, Suppl. 1, Mar. 1967, p. I-132–I-145. 13 refs.

Some characteristic features of the work factor associated with increased pulmonary ventilation during physical exercise were presented. A series of experiments were reported which measured the work factor (represented by oxygen uptake), at different rates of work, and values were obtained using both dynamic and static types of exercise. No definite description of the work factor exists, but a working hypothesis was postulated which stated that the work factor in respiratory regulation is of peripheral nervous origin, closely correlated with the aerobic metabolism and somehow dependent on the mechanical conditions in the muscles, which through afferent nerves, are able to alter the state of the reticular formation surrounding the respiratory center. Increased alveolar P_{CO_2} acted as an additive factor to the work stimulus, and the addition of hypoxic stumulus had a potentiating effect on the work stimulus. These observations place the three ventilatory stimuli (hypercapnia, hypoxia, and work) in a logical relation to one another: hypercapnia and work are additive stimuli for respiration, while hypoxia interacts with the two others, together or singly.

A67-81136
SOME SIMPLE PRINCIPLES AND COMPLEX REALITIES OF CARDIOPULMONARY CONTROL IN EXERCISE.
Fred S. Grodins (Northwestern U., Med. School, Dept. of Physiol., Chicago, Ill.).
Circulation Research, vol. 20, Suppl. 1, Mar. 1967, p I-171–I-178. 14 refs.

The general principles whereby adjustments of ventilation and blood flow extend the organism's range of metabolic activity while simultaneously protecting the composition of his internal environment are very simple, as is the specification of an "ideal" control scheme to accomplish these ends. But the modifications imposed on the definitions of "ideal" and "optional" by constraints present in the real system and the detailed mechanisms by which this modified control policy is accomplished are far from clear. Recognition of the central role of exercise, of the inseparability of respiratory and cardiovascular control, and of the interpretive complications associated with the presence of multiple feedback loops should help speed the resolution of this complex control problem. In addition, it is hoped that a more direct application of optimal control theory will be possible in the near future.

A67-81137
VENTILATION AND CARDIAC OUTPUT IN EXERCISE: INTERACTION OF CHEMICAL AND WORK STIMULI.
Frederick F. Kao, Sukhamay Lahiri, Carol Wang, and Sarah S. Mei (N. Y. State U., Downstate Med. Center, Dept. of Physiol., Brooklyn).
Circulation Research, vol. 20, Suppl. 1, Mar. 1967, p. I-179–I-191. 31 refs.
Grants NIH H-04032-13, HRC U-1490, and Contract HRC I-194; Wellcome Trust supported research.

Experimental evidence was obtained from work done on both dogs and human subjects. The following conclusions seemed justifiable. The exercise stimulus (neutral) and the metabolic loading of CO_2 to the ventilatory system can be separated and recombined. Carbon dioxide (both endogenous and exogenous) produced an additive effect on ventilation with exercise stimulus. Alteration of arterial P_{O_2} produced a potentiation effect to exercise stimulus on ventilation. A similar effect also occurred when hypoxia was accompanied by hypercapnia. Both neural and humoral factors affected cardiac output during exercise. Cardiac output during exercise in anesthetized dogs increased to a magnitude similar to that

of trained, unanesthetized dogs. The increase in cardiac output in anesthetized dogs during exercise was accompanied by an increase in both heart rate and stroke volume, as observed in man during exercise. Mechanoreception (lateral squeezing pressure) cannot be excluded as one of the exercise stimuli for exercise hyperpnea or for the cardiac output increases during muscular exercise. This conclusion was further supported by the facts that mechanical stimuli and P_{CO_2} produced an additive effect on ventilation, and mechanical stimuli alone produced an increase in heart rate. In neither case was there any increase in oxygen consumption.

A67-81138
AEROBIC WORK CAPACITY DURING MAXIMAL PERFORMANCE UNDER VARIOUS CONDITIONS.

Per-Olof Astrand (Phys. Educ. Coll., Dept. of Physiol., Stockholm, Sweden).

Circulation Research, vol. 20, Suppl. 1, Mar. 1967, p. I-202–I-210. 22 refs.

Various items involved in aerobic energy delivery and certain factors that may modify aerobic work capacity were summarized. Oxygen uptake was used to provide a measure of aerobic energy output. Factors investigated with relation to oxygen uptake were work time, muscle mass, work position, ambient oxygen concentration, ambient temperature, dehydration and changes in blood volume, and fever and starvation. There were many conditions in which maximal oxygen uptake was reduced; however, there were situations in which performance capacity was reduced but maximal oxygen uptake not affected. In these cases, the heart rate was usually elevated. Aerobic work capacity is only one of several factors that determine performance capacity, and the characterization of such factors will provide an area of intense study for the physiologist in the future.

A67-81139
AUDITORY NONLINEARITY.

J. L. Goldstein (Inst. voor Perceptie Onderzoek, Eindhoven, The Netherlands).

Journal of the Acoustical Society of America, vol. 41, Mar. 1967, p. 676–689. 15 refs.

Combination tones (CT) produced by two-tone stimuli (f_1 and f_2) at relatively low sound levels contradict the classical view that auditory mechanics is an essentially linear process that suffers significant percentage distortion only at high sound levels. CT level and phase behavior were measured extensively with pitch-cancellation and loudness-balancing methods. Relative level of the most prominent CT $2f_1-f_2$ was nearly unaffected by stimulus level but decreased sharply with increasing frequency interval, being typically 15%–20% for $f_2/f_1 = 1.10$. In contrast, the difference tone was audible only for stimulus levels above 50 db. sensation level (SL), grew to 15% relative distortion only for estimated stimulus levels exceeding 100 db. SL, and was relatively insensitive to frequency interval. Other CT's of the form f_{1-n} (f_2-f_1) were heard and these decreased sharply in level with increasing interval. Other CT's of the form $f_{1-n}(f_2-f_1)$ were heard, and these decreased sharply in level with increasing integer n. The fact that CT's above the stimulus frequencies were inaudible is not caused by stimulus masking but rather reflects instead a mechanical frequency selectivity in the nonlinear source. Thus, although auditory mechanical analysis is not essentially linear, the concept that the cochlea performs a limited resolution frequency-place transformation is supported. Physical studies of the cochlea should elucidate the nature of the hypothesized essential cochlear mechanical nonlinearity.

A67-81140
PITCH PERCEPTION OF PULSE PAIRS WITH RANDOM REPETITION RATE.

Max E. McClellan and Arnold M. Small, Jr. (Iowa U., Iowa City).

(Acoust. Soc. of Am., 66th Meeting, Ann Arbor, Mich., Nov. 1963).

Journal of the Acoustical Society of America, vol. 41, Mar. 1967, p. 690–699. 17 refs.

Time-separation pitch (TSP) is a pitch effect that arises from temporally separated, highly correlated waveforms and is related to the reciprocal time delay between the leading edges of such waveforms. On the assumption that spectral cues are responsible for TSP perception, it was suggested that random triggering of dc pulse pairs with fixed time delay would render the spectrum unspecifiable in an exact sense, thereby degrading the performance of subjects matching pure tones in pitch to TSP. On the assumption that a time-analyzing mechanism is responsible for TSP perception, it was predicted that the presentation of single, nonrepetitive dc pulse pairs would make TSP difficult to perceive since minimum information on which to base a pitch judgment would be available per unit time. The results were not as predicted, i.e., the distribution of pitch matches were essentially the same for conditions of random triggering and single pulse pairs and were highly similar to those generated with regularly triggered dc pulse pairs. These results suggest that the amount of "information" available per unit time is not particularly important to TSP perception and, further, that the assumption concerning a spectral mechanism does not hold.

A67-81141
MASKING OF WHITE NOISE BY PURE TONE, FREQUENCY-MODULATED TONE, AND NARROW-BAND NOISE.

I. M. Young and C. H. Wenner (Jefferson Med. Coll., Philadelphia, Pa.).

(Acoust. Soc. of Am., 69th Meeting, Washington, D. C., Jun. 2–5, 1965).

Journal of the Acoustical Society of America, vol. 41, Mar. 1967, p. 700–706. 15 refs.

NIH supported research.

Threshold measurements were made by Bekesy audiometry for white noise in the presence of pure tones, frequency modulated tones, and narrow-band noises in normal ears. Pure tones in the frequency range of 700–1000 c.p.s. caused maximal masking. When the masking tone had a high distortion factor (13 db. below the fundamental), the masking effect was greater than that for undistorted tones, and was centered between 300 and 400 c.p.s. at 120 db. SPL and 500 c.p.s. at lower intensities. Tones with a distortion factor of 30 db. or more below the fundamental produced masking effects indistinguishable from pure tones with the distortion factor greater than 70 db. below the fundamental. The masking peak at 800 c.p.s. may be explained on the basis of mechanical resonant frequency. While there was some intersubject variation in the masking of white noise by frequency-modulated tones, the mximum effect obtained by frequency-modulated tones was centered at 800 c.p.s., as is the case with pure-tone masking. The masking effect was independent of modulation rate and frequency deviation. Narrow-band noise centered near 2,000 c.p.s. produced the greatest masking effect on white noise. Greater masking—both in shift and spread—was obtained from a narrow-band noise produced by a commercial noise generator than by Zwicker's narrow-band noise with a cutoff slops of 60 db./oct.

A67-81142
CHANCE STIMULUS SEQUENCES FOR DISCRIMINATION TASKS.

Brian J. Fellows (Portsmouth Coll. of Technol., Great Britain). *Psychological Bulletin*, vol. 67, Feb. 1967, p. 87–92. 22 refs.

Sequences of positions for the placing of the positive stimulus in a two-choice visual discrimination task as constructed by Gellerman are examined by means of a hypothesis-analysis technique and are found to be unsatisfactory on two counts: (a) They fail to ensure that no position hypothesis will produce other than chance performance on the learning curve, and (b) they fail to prevent the differential reinforcement of position hypotheses. A new set of sequences is proposed which satisfy these conditions. Suggestions are made as to the combination of these sequences for use in relatively long discrimination tasks.

A67-81143
REDUNDANCY AS A VARIABLE IN PATTERN PERCEPTION.
Selby H. Evans (Tex. Christian U., Fort Worth).
Psychological Bulletin, vol. 67, Feb. 1967, p. 104–113. 16 refs.

Ambiguities in the use of the term redundancy are described and some necessary distinctions are made. Two general kinds of redundancy are noted. Schematic redundancy is associated with a schema, sampling constraints, and improved performance in memory tasks. Discrimination redundancy is associated with increased complexity, absence of sampling constraint, and improved performance in discrimination tasks. The use of Shannon's model to measure technical redundancy is shown to involve ambiguities because three different sets of identification statements can be used to link the model with the experimental situation; a shift from one identification to another results in different implications and different quantities for redundancy. When patterns are identified with signals in a channel, both schematic and discrimination redundancy are shown to have distinct measurable counterparts in Shannon's model.

A67-81144
TEMPORAL FACTORS IN PERCEPTION AND SHORT-TERM MEMORY.
Doris Aaronson (Harvard U., Center for Cognitive Studies, Cambridge, Mass.).
Psychological Bulletin, vol. 67, Feb. 1967, p. 130–144. 80 refs.
Grant NIH MH-14,589, and Grant NIH MH-05,120-05.

The temporal course of perception may be an important determinant of errors that occur in immediate recall tasks. The studies reviewed suggest that the following factors play an important role in perception and short-term memory: (a) the rate at which stimuli are presented, (b) the duration of the stimuli, (c) pre- and poststimulus events. Further, the subject's strategies may in part determine (1) the time elapsing before the various perceptual processes are performed on an item or (2) the order in which items are processed.

A67-81145
EXPERIENCE WITH THE ACCLIMATIZATION PROCESS AT MEDIUM ALTITUDE [ERFAHRUNGEN MIT DEM AKKLIMATISATIONSVERLAUF IN MITTLERER HOHE].
L. Samek, J. Dvorak, V. Dolezal, M. Moravek, and J. Rybak (Med. Fak., Inst. für Flugmed., Prague, Czechoslovakia).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1,2,3, 1966, p. 279–287. 9 refs. In German.

Competition at an altitude between 2,000 and 2,500 m. above sea level demands specific and methodical preparation. This preparation must emphasize a conditioning training program in colaboration with a sports-physician and include if possible a training period of two to three weeks at medium altitude. There may be athletes who have a poor adaptation ability. They should be excluded from competition at medium altitude. Competitions at 2,300 m. above sea level are not perilous for well prepared and healthy athletes. The negative acclimatization reactions can best be overcome by an individual training beginning at the first day and by an optimal provision of food and liquid and by an optimal daily regimen (sufficient sleep, well organized recreation). To suppress unfavorable reactions a medicamentious therapie is appropriate.

A67-81146
FIRST RESULTS ON THE ACCLIMATIZATION OF ITALIAN ATHLETES IN MEXICO [PREMIERES DONNEES SUR L'ACCLIMATEMENT DES ATHLETES ITALIENS A MEXICO].
Antonio Venerando (CONI, Inst. de Med. du Sport, Rome, Italy).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1,2,3, 1966, p. 288–299. 18 refs. In French.

Twenty-four athletes of different kinds were examined in Rome, twice during a sojourn of 18 days in Mexico City and again in Rome. The measured parameters were the number of red blood cells, the amount of hemoglobin and the heart rate at rest. A sufficiently stabilized heart rate was found after ten days. On the other hand a stabilization of the number of red blood cells and of the amount of hemoglobin was not reached until the end of the sojourn in Mexico City.

A67-81147
ON PHYSIOLOGICAL MECHANISMS OF IMPAIRMENT OF PHYSICAL EXERCISE PERFORMANCE IN HYPOXAEMIA.
N. V. Zimkin (Lesgaft Inst. of Phys. Culture, Dept. of Physiol., Leningrad, USSR).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1,2,3, 1966, p. 300–304. 11 refs.

The performance impairment observed in some physical exercises under conditions of hypoxemia combined with hypo- and hypercapnia were connected with changes in the regulation of numerous functions. A significant role in this phenomenon belongs to hemodynamic changes and to the deterioration of certain sensory organ functions. After a period of acclimatization, these functions may return to their original values

A67-81148
PROJECT OLYMPICS.
E. R. Dickinson, M. J. Piddington, and T. Brain (U.S. Army Res. and Develop. Group, European Res. Office, Frankfurt a. Main, West Germany).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1,2,3, 1966, p. 305–313.

The Ballistic Research laboratories made a study of the effect of 2,400 m. altitude on various track events. It appears that all of the projectiles studied will travel significantly farther at Mexico City than at sea level. Approximations of these additional distances are: shot—5.8 cm.; hammer—53 cm.; javelin—69 cm.; and discus—162 cm. The values given here are merely the best estimates that can be made. Definitive values can be computed only when experimental data on the aerodynamic behavior of the hammer, javelin and discus become available. The data presented here should not be used

to correct Olympic records. It is apparent, however, that certain field events at Mexico City must be corrected to sea level for comparison with existing Olympic records. If truly accurate corrections are to be made, adequate experimental data must be obtained.

A67-81149
LONG PERIOD INVESTIGATION OF THE ACCLIMATIZATION OF SPORTSMEN AND NON-SPORTSMEN TO AN ALTITUDE OF 2000 M [LANGSSCHNITTUNTERSUCHUNGEN ZUR AKKLIMATISATION VON SPORTLERN UND NICHTSPORTLERN IN 2000 M HOHE].

M. J. Halhuber (Med. U. Klin., Innsbruck, Austria).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1,2,3, 1966, p. 204–220. In German.

The results of the experimental series A show that there are increased reactions to load-tests not only in the first days of a stay at altitude. The acclimatization to altitudes between 2,000 to 3,000 m. takes place in phases. In the experimental series B a comparison of the pulse and blood-pressure levels between non-athletes and skiers shows that the lowest values (especially during work and in recovery) are reached at the same time as in series A, namely, on the 13th and 14th day at altitude, respectively.

A67-81150
THE INFLUENCE OF ALTITUDE CHANGE ON ALTITUDE ACCLIMATIZED MEN [UEBER DEN EINFLUSS DES HOHENWECHSELS AUF DEN HOHENAKKLIMATISIERTEN MENSCHEN].

H. Jungmann.
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1, 2,3, 1966, p. 221–226. 6 refs. In German.

Twenty-three acclimatized residents of alpine regions did not show typical reactions at the change to 2,000 m. above sea level as did nonacclimatized residents of low regions. The measured parameters were: blood pressure in reclined position, heart rate at rest, ventilatory rate at rest, pulse curve, electroencephalogram and a test of coordination.

A67-81151
SMALL GROUP ECOLOGY.

Robert Sommer (Calif U., Davis).
Psychological Bulletin, vol. 67, Feb. 1967, p. 145–152. 40 refs.

The systematic study of the arrangement of individuals in small groups began in 1950 using post hoc analysis of data collected for other purposes. Only recently have investigators begun to design experiments with group ecology as the major independent variable. Results have shown that spatial arrangement is a function of group task, the degree of relationship of individuals, personalities of the individuals, and the amount and kind of available space. The resulting arrangement in turn affects communication, friendship, and status differentiation between individuals. Knowledge of small group ecology can help in developing a theory of social relationships that includes the environment in which interaction takes place as well as principles for designing functional environments from the standpoint of human relationships.

A67-81152
PHYSICAL FITNESS OF YOUNG FRENCH UNIVERSITY STUDENTS. COMPARISON OF DIFFERENT TESTS WITH MAXIMUM OXYGEN CONSUMPTION [L'APTITUDE PHYSIQUE CHEZ LE JEUNE UNIVERSITAIRE FRANCAIS. COMPARAISON DE DIFFERENTS TESTS AVEC LA CONSOMMATION MAXIMALE D'OXYGENE].

R. Flandrois and J.-R. Lacour (Lyon U., Fac. de Med. et Pharm., France).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1,2,3, 1966, p. 49–55. 16 refs. In French.

The maximum oxygen uptake was measured in 75 male subjects and compared with the results of different individual performance tests. The correlation was relatively good for the test according to Astrand ($r = 0.67$) and the working capacity according to Sjostrand-Pitteloud ($r = 0.59$). As for the Harward and Ruffier-Dickson tests the correlation was consider ably lower ($r = 0.39$, respectively 0.37).

A67-81153
TEST OF THE EVALUATION OF THE ADAPTIVE CAPACITY OF WORK BY DETERMINATION OF URINARY ELIMINATION OF CATECHOLAMINES (ADRENALINE (A), NORADRENALINE (NA) AND VANILLYL-MANDELIC ACID (VMA)) [ESSAI D'EVALUATION DE LA CAPACITE D'ADAPTATION A L'EFFORT PAR DETERMINATION DE L'ELIMINATION URINAIRE DES CATECHOLAMINES (ADRENALINE -A-, NORADRENALINE -NA-) ET DE L'ACIDE VANILLYL-MANDELIQUE (VMA)].

J. Klepping, J.-P. Didier, and A. Escousse (Centre Hosp. Reg. and U., Dept. d'exploration fonctionnelle, Lab. de Physiol., Dijon, France).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1,2,3, 1966, p. 266–278. 13 refs. In French.

The adrenosympathic reaction during muscular work can be examined by determining the catecholamines and the vanillylmandelic acid in the urine. The reaction is dependent upon the status of training. If quantity and duration of the load stay within the adaptation limits of the individual—which can be determined by heart rate, O_2-uptake, the lactic acid level, and the recovery to the normal values—there are no significant deviations from the norm of the secretion of the catecholamines and the vanillyl-mandelic acid. If the adaptation limits are passed an increased secretion of the total catecholamines and the vanillyl-mandelic acid can be observed. The increase is dependent upon amount and duration of the load but not directly proportional. The secretion of the vanillyl-mandelic acid shows the highest significance. It can be assumed that the determination of the vanillyl-mandelic acid in the urine provides valuable indications of adaptation capacity in course of muscular stress.

A67-81154
MAN'S ACCLIMATIZATION TO ALTITUDE DURING THE FIRST WEEK AT 3,800 M.

K. Klausen (Copenhagen U., Lab. for Theory of Gymnastics, Denmark).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1,2,3, 1966, p. 246–253. 9 refs.
NASA Grant NSG 708; Grants PHS CD 00056-02, and PHS HE 06-308-04.

The change of the cardiac output (Q) in rest and submaximal work was observed in three subjects during the first eighteen days of acclimatization to 3,800 m. In two young subjects Q increased to a maximum on the first day at high altitude and decreased to normal or subnormal sea level values during the following week. One older subject showed a slower increase of Q during work, but it remained elevated until the last day at 3,800 m. The change of Q seen in the subjects is discussed in relation to simultaneous determinations of heart rate and blood pressure, and also to measurements of blood volume and hematocrit.

A67-81155
THE BEHAVIOR OF SEVERAL INTERESTING SPORTS-MEDICAL QUANTITATIVE FUNCTIONS OF ALPINE RACING SKIERS IN THE SCOPE OF ALTITUDE ADAPTATION [UEBER DAS VERHALTEN EINIGER SPORTMEDIZINISCH INTERESSANTER FUNKTIONSGROSSEN BEI ALPINEN SKIRENNLAUFERN IM RAHMEN DER HOHENANPASSUNG].

E. Raas (Inst. für Sport- und Kreislaufmed., Innsbruck, Austria).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1, 2, 3, 1966, p. 254–265. 9 refs. In German.

An altitude of 2,850 m. considerably influences the working capacity even of trained athletes. An optimal working capacity is not only accomplished by training but by additional acclimatization as well, whose duration is directly proportional to the difference in altitude. Fitness and acclimatization are different conditions limiting performance. The latter is a function of time and cannot be accelerated or improved by physical activity. Resting adaptation is accomplished faster than working adaptation. Highly trained athletes are apt to meet more difficulties to adaptation than untrained. Whereas the absolute maximum in performance is decreased at altitude, an earlier performance standard can be improved by a stay at altitude. Studies done in 1965 did not show specific effects of altitude at levels below 2,000 m. After a distinct adaptation reaction at the change to 2,800 m., the findings approach the initial values, but do not quite reach them even after four weeks of training. For a downhill competitor a period of four weeks is necessary for an optimal adaptation to altitude.

A67-81156
HUMAN LOCOMOTION ON THE EARTH AND IN SUBGRAVITY.

R. Margaria (Milan U., Ist. di Fisiol. Umana, Italy).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1,2,3, 1966, p. 159–167. 6 refs.

The mechanics of locomotion were investigated by studying the trajectory of the center of gravity of the body using various methods. Human walking involves the supply of energy by a force directed upward toward the center of gravity of the body. Running differs in that horizontal energy is supplied by a horizontal component of push while the upward component reaches a limit of about the same magnitude as the body weight. Elastic energy of contracted muscles is also used in running. In reduced gravity forward progression would be appreciably impaired and the step cycle time increased. Jumping may be the best method of human locomotion on the moon. Acceleration would probably be much slower on the moon than on the earth. At an altitude of only 2,300 m. the time for sprints is shortened. This reduction is not due to different gravitational conditions, but to reduced air density.

A67-81157
PHYSICAL EFFORT AND ALTITUDE.

W. Missiuro.
Schweizerische Zetischrift für Sportmedizin, vol. 14, nos. 1, 2, 3, 1966, p. 168–176. 10 refs.

Research on the effects of physical exercise at altitude on acclimatized and non-acclimatized subjects showed that the acclimatized individual had a higher capacity to perform muscular work in hypoxic conditions and had less marked signs of fatigue, cyanosis, dyspnea and hyperhidrosis. Problems relating to competitive sports events at high altitudes and a need for acclimatization of participants were discussed. Physiological changes at rest and during exercise at altitude and factors which increase work capacity at high altitude were given. In preparation for competitive events at high altitudes, athletes must consider the additional stresses of changes in daily rhythm, climate and oxygen pressure, and compensate for them by achieving their maximum levels of individual acclimatization.

A67-81158
THE INFLUENCE OF PHYSICAL STRESS AND EXERCISE ON GROWTH HORMONE AND INSULIN SECRETION IN MAN.

Don S. Schalch (Rochester U., School of Med. and Dentistry, Dept. of Med., Endocrinol. Unit., N. Y.).
Journal of Laboratory and Clinical Medicine, vol. 69, Feb. 1967, p. 256–269. 52 refs.
Grant NIH AM-08943.

The effects of physical stress and exercise on the secretion of growth hormone and insulin were studied in several groups of subjects undergoing surgery, electroconvulsive therapy, competitive and non-competitive exercise, and acute physical trauma. Associated changes in plasma glucose and nonesterified fatty acids (NEFA) were also measured. Plasma growth hormone levels rose significantly in many subjects during periods of physical stress or exercise, while insulin values either remained unchanged or fell slightly. Epinephrine administration did not stimulate the release of growth hormone, and the failure of plasma insulin levels to rise in response to stress-induced hyperglycemia is consistent with the recent observation that the infusion of epinephrine impairs insulin release. Plasma glucose and NEFA levels rose as expected in many individuals during physical stress and exercise. The results of this study suggest that certain stressful situations may be diabetogenic not only because of the well-known release of epinephrine and the corticosteroids but also in part because of an increased release of growth hormone on the one hand and an epinephrine-induced suppression of insulin secretion on the other.

A67-81159
EFFECTS OF MEPROBAMATE ON MOODS, EMOTIONS, AND MOTIVATIONS.

Jean S. Cameron, Priscilla G. Specht, and G. R. Wendt (Rochester U., Dept. of Psychol., N. Y.).
Journal of Psychology, vol. 65, Mar. 1967, p. 209–221. 5 refs.
Contract DA 49-193-MD-24 and Grant NIMH MH-4681; Rochester U., Wallace Labs., Chas. Pfizer and Co., Bristol-Myers Co., Smith Kline and French Labs., Menley and James Labs., and Warner-Lambert Res. Inst. supported research.

In four experiments conducted over a period of seven years on 144 normal male and female college-students, 21 years or older, the authors made 234 determinations of the effects of meprobamate on moods, emotions, and motivations as determined by free-choice adjective check lists and forced-choice adjective check lists. These were compared to 318 determinations after placebo in the same subjects. These normal subjects, given doses of 400, 600, or 800 mg., showed sedation effects with a statistical significance often better than $p = .001$. They became more drowsy, washed-out, bored, and blue than after placebo, as well as less active, friendly, and industrious. It is concluded that meprobamate is an active drug and that normal subjects yield valuable information about its effects.

A67-81160
MONITORING THE ECG WAVEFORM.

John A. Bushman.
Bio-Medical Engineering, vol. 2, Mar. 1967, p. 106–108.

The development is described of an instrument capable of recognizing changes in electrocardiographic patterns thereby eliminating the necessity of monitoring the EKG display by an

individual. It is capable of converting a complex waveform into a simple one in which width of trace and smoothness of the edge are the only important features. The apparatus includes an analogue and digital computer, oscilloscopes, monitor, and pen-, potentiometric-, and tape recorders.

A67-81161
PROTECTIVE EFFECT OF CYSTAMINE AND AET GIVEN AT VARIOUS INTERVALS BEFORE IRRADIATION.

L. Tkadlecek (Mil. Inst. of Med. Res. and Postgraduate Study, Hradec Králové, Czechoslovakia) and Vera Jurásková (Czech. Acad. of Sci., Inst. of Biophys., Brno).

Nature, vol. 213, Mar. 25, 1967, p. 1267–1268.

Mice were given whole-body X-ray at a dose rate of 436 r./min. The animals were divided into control groups and those injected intraperitoneally with either cystamine or AET (2 l-amino ethyl isothiouronium). All mice were killed nine days after the beginning of the experiment and their spleens removed and fixed. The results gave evidence favoring an assumption that the radioprotective efficiency of cystamine and AET on haematopoietic stem cells in the spleen of irradiated mice was brought about soon after they were intraperitoneally injected. Dose reduction factors for both substances were greatest when administered between four and seven min. before irradiation. The dose reduction factor for cystamine was higher than that for AET. After longer intervals the radioprotective effect of cystamine decreased quickly, even as early as eight min. after the injection the dose reduction factor being no higher than that of AET.

A67-81162
ULTRA-KINAESTHETIC JUDGMENT OF SIZE.

A. Zajaczkowska (U. Coll. London, Med. Res. Council, External Staff, Dept. of Psychol., Great Britain).

Nature, vol. 213, Mar. 25, 1967, p. 1270.

In an experiment carried out from an attic window with a wide view, 20 observers were asked to imagine they were swimming through the air towards distant buildings or climbing their walls. During certain trials each observer was asked to imagine himself clinging to the face of a chimney or climbing a tower and afterwards to estimate visually the chimney or tower size, as well as the size of their body members. The results showed that the estimates based on the imaginary tasks and on the observers' size anthropometrically were better than the visual estimates by a highly significant amount ($P=0.0006$ in the case of the chimney, and $P=0.002$ in the case of the tower). The visuo-kinesthetic estimates were remarkably accurate in the case of several observers and, as expected, depended neither on their perception of distance nor on K (Luneburg's curvature of visual space). They were also independent of an observers' knowledge of his body dimensions. Such proprioceptive sensitivity (probably connected with a motor type of imagery and with former visuo-motor experience) may be advantageous in survival tests as used in space research.

A67-81163
COOPERATION, COMPETITION, AND INTERPERSONAL ATTITUDES IN SMALL GROUPS.

Robert B. Zajonc and Irwin C. Marin (Mich. U., Ann Arbor).

Psychonomic Sciences, vol. 7, Mar. 15, 1967, p. 271–272. 5 refs.
Contract Nonr-1224(34) NR 170-309.

Previous theorizing maintains that interpersonal attitudes of cooperating and competing individuals are primarily a function of the antecedent motivational interdependence that characterizes these relations. The present experiment sought to establish if outcomes, rather than motivational antecedents, of cooperation and competition are a sufficient condition of the resultant interpersonal attitudes. Two-man teams played a non-zero sum game, in which one member of each team always increased the likelihood of his team's success, while the other always decreased it. Successful members were found to have more favorable attitudes toward their opponents than toward their teammates. The opposite results were obtained for unsuccessful members. While the evidence for the dependence of interpersonal attitudes upon the outcomes of cooperation and competition was clear, no support was found for the hypothesis that interpersonal attitudes also depend on antecedent motivational interdependence.

A67-81164
PERCEPTION AND SHORT-TERM STORAGE IN DICHOTIC LISTENING PERFORMANCE.

James Inglis and Carol L. Tansey (Temple U., Med. School, Philadelphia, Pa.).

Psychonomic Science, vol. 7, Mar. 15, 1967, p. 273–274. 9 refs.
Grant NICHHD HD 02250-01.

Alternative hypotheses were put forward to account for order-effect in dichotic listening performance. One of these involves a distinction between perceptual and short-term storage mechanisms, the other requires only different storage mechanisms. If the distinction between perception and storage may be regarded as related to the difference between activity traces and structural traces, then the repeated digit series technique offers a means of testing these alternatives. Results suggest that a single, rather than a dual mechanism underlies order-effect in the sequential recall of simultaneous stimuli.

A67-81165
DETERMINATION OF PHYSICAL FITNESS: MORPHOLOGICAL INDICES AND CIRCULATORY AND RESPIRATORY FUNCTION TEST [LA DETERMINATION DE L'APTITUDE PHYSIQUE: LES INDICES MORPHOLOGIQUES ET LES EPREUVES FONCTIONNELLES CIRCULATOIRES ET RESPIRATOIRES].

R. Flandrofs, J.-R. Lacour (Fac. de Méd., Lyon, France), and J. Sepetjian.

Revue des Corps de Santé des Armées, vol. 7, Dec. 1966, p. 961–981. 49 refs. In French.

Morphology (height, weight) and physical fitness (cardiovascular and respiratory) are valuable indices in the selection and vidico-physiological surveillance of flying personnel. Determination of physical fitness may be either direct, such as in the evaluation of maximal oxygen consumption during effort, or indirect. A review of various indirect methods includes the following cardiovascular tests: Johnson, Brouha and Darling rolling table test; Blake's capacity of optimal work test; Crampton's test or test of orthoclinostatism; Martinet test; Lian's test, Schneider test; Ruffier and Ruffier–Dickson indices of cardiac resistance; Harvard step-test; and the Flack test. Of the respiratory function tests, the following are considered: vital capacity; apnea test; determination of aerobic capacity (Astrand–Ryhming test); and determination of work capacity (Pitteloup test).

A67-81166
CARDIAC RESPONSIVENESS AND DIFFERENTIAL CONDITIONING.

Ronald S. Wilson and Pryse H. Duerfeldt.

Journal of Comparative and Physiological Psychology, vol. 63, Feb. 1967, p. 87–94. 7 refs.
Grant NIMH MH-06332.

Discrimination difficulty was systematically varied in two experiments involving a visual discrimination problem. During 60 trials of differential conditioning with a shock US, beat-to-beat pulse-rate changes, measured for selected trials, showed a characteristic biphasic pattern on nonshock trials-initial deceleration

followed by acceleration. Shock-produced changes were similar although acceleration was more prominent. Magnitude of change was related to discrimination difficulty and did not depend on training procedure (converging discriminable stimuli vs. maintaining fixed level of difficulty throughout). Results replicate a previous study and generally conform to Liddell's analysis of differential conditioning. Vigilance is proposed as the intermediary process linking discrimination difficulty to magnitude of pulse-rate change.

A67-81167

THE EFFECT OF HYPOXIA ON THE LACTIC DEHYDROGENASE/LDH/ACTIVITY OF SERUM AND HEART MUSCLE OF RATS.

L. Selmeci, A. Farkas, E. Pósch, I. Szelényi, and J. Sós (Med. U., Inst. of Pathophysiol., Budapest, Hungary).

Life Sciences, vol. 6, Mar. 15, 1967, p. 649–653. 20 refs.

Rats were kept in a low-pressure chamber (simulated altitude of 18,300 ft.) for six hr., to induce hypoxia. The lactic dehydrogenase (LDH) activities in the sera and in the heart muscle extracts were measured. The total LDH activity and the activity of heat stable isozyme in serum elevated significantly in the experimental group. The ratio of the activity of heat stable isozyme related to the total LDH activity did not change significantly. The LDH activity in the heart muscle extract slightly decreased in the experimental group but this change was not significant. It is suggested that as a result of a general cellular damage LDH liberates from the different organs into the sera of rats exposed to hypoxia.

A67-81168

MONOCULAR FIXATION IN HUMAN EYE MOVEMENT.

P. R. Boyce (Reading U., J. J. Thomson Phys. Lab., Whiteknights Park, Great Britain).

Proceedings of the Royal Society, vol. 167, Mar. 28, 1967, p. 293–315. 17 refs.

PHS supported research.

The monocular eye movements associated with the maintenance of fixation were recorded using the contact lens/optical lever system. The records, in analogue form on magnetic tape, were subsequently converted to a digital form and analyzed on a computer. It is found that there is reasonable agreement between the responses of the same subject on different days. Analysis of the magnitudes and preferred directions of saccades and drifts and their interrelationships show that there is an elliptical overall fixation area which is sub-divided into a series of overlapping short-period fixation areas. The results indicate that saccades occurring during fixation have one of two functions, either (a) to recenter the retinal image on the short-period mean fixation position, or (b) to move the short-period fixation area, possibly to avoid retinal receptor fatigue. An organizational model of the fixation control system has been developed from the analysis of results.

A67-81169

URINARY CATECHOLAMINE EXCRETION DURING INSTRUMENTAL CONDITIONING.

Lindsay A. Graham, Sanford I. Cohen, B. M. Shmavonian, and Norman Kirshner (Duke U., Med. Center, Depts. of Psychiat. and Biochem. and Div. of Psychophysiol. Res., Durham, N. C.).

Psychosomatic Medicine, vol. 29, Mar.–Apr. 1967, p. 134–143. 25 refs.

Grants AF-AFOSR 57-64, and PHS GM 05-385; NSF and Geigy Pharm. Co. supported research.

Urinary excretion of adrenaline (A) and noradrenaline (NA) were measured for three groups of subjects exposed to an instrumental conditioning experiment. These subjects were 26 uninformed men, 18 women, and 6 informed men, who could learn to avoid or escape electric shock, or not perform the response. The different behavioral patterns were not consistently related to catecholamine excretion rates. Uninformed men showed a rise in A excretion on the first day, and informed men had high preexperimental values. Men did not differ from women in their over-all A excretion, but tended to respond more during certain parts of the experiment. One possibility is that there are sex differences in the adrenal response to emotional stress. Men had an over-all mean NA excretion of 2.01 μg./hr., compared with 1.12 μg./hr. for women. Men showed more variability than women, with particularly high values during the postexperimental interview. The sex differences were not entirely due to differences in body weight, and were perhaps due to greater neuromuscular activity in men. In the middle range of urine volumes, which included most of the specimens, there was no consistent correlation for either amine, and the results found for amine excretion did not appear to be due to urine volume differences. It is likely that the degree of catecholamine excretion reflects the intensity of the emotional response more than the qualitative nature of the subjective experience.

A67-81170

EFFECT OF FOUR MULTIPLES OF A BASIC MIXTURE OF ESSENTIAL AMINO ACIDS ON NITROGEN RETENTION OF ADULT HUMAN SUBJECTS.

Helen E. Clark, Kay Fugate, and Patricia E. Allen (Purdue U., Agr. Expt. Sta. and School of Home Econ., Depts. of Foods and Nutr., Lafayette, Ind.).

American Journal of Clinical Nutrition, vol. 20, Mar. 1967, p. 233–242. 18 refs.

Grant PHS AM-08533.

Two mixtures of essential amino acids were developed that contained limited amounts of all essential amino acids and maintained nitrogen equilibrium in adult human subjects when part of the amino acids was supplied by white wheat flour and part by crystalline amino acids. A modification of one of these mixtures was useful in studying the effect of simultaneous increments of all essential amino acids on nitrogen balance. Mean nitrogen balances were −0.07, +0.22, +0.56, and +0.72 g. respectively, when 1.0, 1.5, 2.0, and 2.5 times this basic mixture were administered. The regression of nitrogen retention on intake of essential amino acids was linear, and did not differ when 6.00 or 9.00 g. of total nitrogen were consumed.

A67-81171

PROTECTIVE ACTION OF CARBON DIOXIDE AGAINST ANOXIA WITH AND WITHOUT ANAESTHESIA.

Bendt J. Wilhjelm.

Acta Pharmacologica et Toxicologica, vol. 24, no. 4, 1966, p. 355–362. 15 refs.

Experiments were conducted with different carbon dioxide concentrations in the inspired air with a view to studying their effects on the tolerance of mice to anoxia. It appeared that inspiration of gas mixtures containing from 2.5 to 10% carbon dioxide greatly prolonged the survival time of anoxic mice compared with that of control mice. The prolongation of the survival period was most pronounced when the inspired air contained 5% carbon dioxide. The effect of inspiring 5% carbon dioxide on the tolerance to anoxia was also studied on mice anaesthetized with thiopentone and with halothane. The thiopentone-anaesthetized anoxic mice inspiring a gas mixture containing 5% carbon dioxide were found to be far more tolerant of anoxia than either non-anaesthetized anoxic control mice or halothane-anesthetized, anoxic mice. The further prolongation of survival time seen after admixture of carbon dioxide with the inspired air is attributed to its increasing effect on cerebral blood flow. Similar investigations into the effect of 5% carbon dioxide inspired by halothane-anaesthetized anoxic mice gave the result that inspiration of carbon

dioxide had no appreciable effect on the tolerance of these animals to anoxia, presumably because halothane anaesthesia as such increases the cerebral blood flow.

A67-81172
INDIVIDUAL DIFFERENCES IN RESPONSE TO REM DEPRIVATION.

Rosalind Dymond Cartwright, Lawrence J. Monroe, and Cornelius Palmer (Ill. U., Coll. of Med., Dept. of Psychiat., Div. of Psychol., Chicago).

Archives of General Psychiatry, vol. 16, Mar. 1967, p. 297–303. 18 refs.

Grant NSF GS-649 and Dept. of Mental Health, Ill. supported research.

Ten subjects were deprived of their normal amount of rapid eye movement (REM) time by being interrupted for three nights to explore the range of individual differences in response to this stress condition, and the variations in adaptation style. The more often subjects needed to be awakened to accomplish the deprivation, the more unstable was the electroencephalographic (EEG) record during the recovery period. Subjects who responded to the reduction of REM time with repeated attempts to regain it and much subsequent EEG disturbance were the most disturbed in response to a hallucinogenic drug. This pattern of response to deprivation was called Disruption. Another style of response which was independent of the first was called "Substitution." The more often subjects were able to report dreamlike content on the awakenings, the less was their REM increase or compensation phenomenon during the recovery period. This pattern, may represent a next stage beyond disruption of adaptation to the reduced REM time. The third finding was that those who do show the recovery pattern of increased REM, as classically described, appear to be those who have good control, are perceptually more field independent, and can tolerate delayed fantasy gratification. This pattern we call Compensation. Particularly important now may be the investigation of the relation of these patterns of individual response to the development of symptom behavior when changes in the normal sleep cycle are more extreme, such as those which take place in space explorations. Such work may yet fulfill the promise of new insights to help explain the interplay between nighttime and daytime behavior.

A67-81173
A NEW HAZARD IN CLOSED ENVIRONMENTAL ATMOSPHERES.

Raymond A. Saunders (Naval Res. Lab., Washington, D. C.).

(Atmospheric Contamination in Confined Spaces, 2nd Ann. Conf., Dayton, Ohio, May 4, 1966).

Archives of Environmental Health, vol. 14, Mar. 1967, p. 380–384. 11 refs.

A government contractor recently evaluated a completely integrated life support system in an experiment which involved maintaining five men for 30 days in a hermetically sealed environmental chamber. Undesirable contaminants developed in the chamber and persisted in spite of the contaminant control system. The atmosphere acquired an odor which became increasingly disagreeable. The crew developed anorexia, became nauseated, suffered severe vomiting, and developed headaches, and odd facial sensations. These symptons together with other difficulties prompted test termination after four days. Preliminary efforts to pin-point the cause of the sickness were unsuccessful. Later analysis of the chamber atmosphere at the Naval Research Laboratory identified 23 volatile compounds. Among these were monochloroacetylene and dichloroacetylene. The latter compound is known to produce symptoms identical to those experienced by the chamber crew. Dichloroacetylene has since been found at low concentration in a submarine atmosphere also. A few chlorinated hydrocarbons customarily have been tolerated in most closed environmental atmospheres because of their general usefulness and relatively low toxicity. Such was the case in both these instances. The toxicant was produced through the action of an improperly operating element of the environmental control system on one of these compounds.

A67-81174
THE PRODUCTION OF CARBON MONOXIDE FROM HEMOGLOBIN IN VIVO.

R. F. Coburn, W. J. Williams, P. White, and S. B. Kahn (Pa. U., School of Med., Depts. of Physiol., Graduate Div., and Med., Philadelphia).

(Federation of Am. Soc. for Exptl. Biol., Chicago, Ill., Apr. 1964).

Journal of Clinical Investigation, vol. 46, Mar. 1967, p. 346–356. 31 refs.

Grants PHS AM-07301, PHS 3 MO1 FR-40-05, PHS K2-HE-11,564, PHS K3-HE-2629, and PHS T1-AM-5228; Life Insurance Med. Res. Fund supported research.

Dogs anesthetized with pentobarbital were shown to produce carbon monoxide at an average rate of 0.21±(SD) 0.05 ml. per hr. After intravenous injection of erythrocytes damaged by incubation with N-ethylmaleimide, CO was produced in excess of base-line production for three to four hr. with an average yield of 0.89±(SE)0.046 μmole of carbon monoxide to one μmole of heme degraded. After intravenous injection of N-ethylmaleimide (NEM)-treated erythrocytes containing hemoglobin labeled with ^{14}carbon, ^{14}CO was produced. It was also produced after intravenous injection of solutions of hemoglobin-^{14}C and of reconstituted methemoglobin containing hemin-^{14}C, but not after injections of methemglobin containing globin-^{14}C. The average yields of ^{14}CO from metabolized heme in the experiments with damaged erythrocytes and hemoglobin solutions were 89±(SE) 4.6 and 97±(SE) 17.0%, respectively. These results demonstrate that the CO produced during hemoglobin degradation arises from the heme moiety. The yield of ^{14}CO after injection of hemoglobin-^{14}CO solutions decreased significantly to values of 35 and 42% in two experiments when exogenous CO was added to the body stores, resulting in blood carboxyhemoglobin levels of 11.3 and 13.2% saturation. This finding suggests oxidative metabolism is required during catabolism of hemoglobin to CO and that carboxyhemoglobin levels in this range are sufficient to cause inhibition. After intravenous injection of either hemin-^{14}C or protoporphyrin-^{14}C, ^{14}CO was also produced. After injection of protoporphyrin-^{14}C labeled bilirubin was isolated from gall bladder bile, and labeled hemin was isolated from the liver. It is likely that protoporphyrin is converted to heme before the formation of CO. There was a large difference between the maximal rates of catabolism of hemoglobin to CO observed after injection of damaged erythrocytes and hemoglobin solutions. The limiting parameters in these processes are not yet clear.

A67-81175
THE EFFECTS OF CHRONIC HYPOXEMIA ON ELECTROLYTE AND ACID-BASE EQUILIBRIUM: AN EXAMINATION OF NORMOCAPNEIC HYPOXEMIA AND OF THE INFLUENCE OF HYPOXEMIA ON THE ADAPTATION OF CHRONIC HYPERCAPNIA.

Daniel G. Sapir, David Z. Levine, and William B. Schwartz (Tufts U., School of Med., Dept. of Med. and New England Med. Center Hosps., Renal Lab., Boston, Mass.).

Journal of Clinical Investigation, vol. 46, Mar. 1967, p. 369–377. 13 refs.

Grants NHI H-759 and NHI HE 5309; Am. Heart Assn. supported research.

Balanced studies in normal dogs were carried out in order to appraise the effects of chronic hypoxemia on acid-base and electrolyte equilibrium. During the first phase of observation, a state of "pure" hypoxemia was produced by reducing the oxygen concentration (utilizing nitrogen as a diluent) and by adding carbon dioxide to the environment in a concentration sufficient to keep arterial CO_2 tension (P_{CO_2}) within normal limits. The data demonstrated that such a nine-day period of normocapneic hypoxemia had no effect on electrolyte excretion and was virtually without effect on plasma composition. During the second phase of observation, the hypoxemic dogs were subjected to stepwise increments in arterial P_{CO_2} in order to evaluate the effects of the low P_{O_2} on the acid-base adjustments to a chronic state of hypercapnia. At least six days were allowed for extracellular composition to reach a new steady state at each level of inspired carbon dioxide. The data demonstrated a rise in both plasma bicarbonate concentration and renal acid excretion that was not significantly different from that which has been described previously for hypercapnia without hypoxemia. As in earlier studies, plasma hydrogen ion concentration rose with each increment in P_{CO_2} each mm. Hg increment in P_{CO_2} leading to an increase in hydrogen ion concentration of 0.32 nmole per L. It thus appears that the chronic "carbon dioxide response curve" is not significantly influenced by moderately severe hypoxemia.

A67-81176
REGRESSION OF DIETARY CIRRHOSIS IN RATS FED ALCOHOL AND A "SUPER DIET": EVIDENCE OF THE NON-HEPATOTOXIC NATURE OF ETHANOL.
Akira Takada, Eduardo A. Porta, and W. Stanley Hartroft (Hosp. for Sick Children, Res. Inst., Toronto, Canada).
American Journal of Clinical Nutrition, vol. 20, Mar. 1967, p. 213–225. 45 refs.
Grant MRC, Canada MA-1904.

The effect of a large supplement of alcohol on the functional and structural events occurring during dietary treatment of advanced stages of experimental nutritional cirrhosis previously produced in rats is investigated. The addition of alcohol (36% of total caloric intake) to the nutritionally adequate super diets permitted regression of cirrhosis to the same degree as in comparably cirrhotic animals given the same diets without the added alcohol. This result provides evidence against the hypothesis that alcohol is cirrhogenic by virtue of a direct hepatotoxic action. By implication, it affords hope for achieving some recovery of liver function in even those alcoholics who cannot give up spirits, if only they can be induced to consume simultaneously high protein diets containing abundant vitamins and essential food factors.

A67-81177
A MANNED ORBITAL RESEARCH LABORATORY (MORAL): DESIGN AND UTILIZATION.
R. J. Gunkel and C. E. Starns (Douglas Aircraft Co., Inc., Space Systems Centre, Huntington Beach, Calif.).
Spaceflight, vol. 9, Mar. 1967, p. 81–94.

Detailed reports now circulating in various research centers of the National Aeronautics and Space Administration (NASA) are tending to concentrate on the merits of the manned space laboratory as a tool for assisting in the conservation of Earth's natural resources. Particular areas of observation–supplementing surveys by land, sea and air-include assistance in the areas of agriculture, forestry, geography and oceanography. Already definitive studies have indicated the prospect of substantial savings arising from the large-scale "over-view" of our planet made possible by space techniques leading to greater conservation of the world's food, water and mineral resources and the improvement in productivity necessary to meet the increasing demands of Earth's population in future years. The paper describes the pertinent results of a definitive study of a Manned Orbital Research Laboratory with many Earth-centered applications performed by Douglas Aircraft Company under NASA Contract NASI-3612. The system outlined consists of a six- to nine-man laboratory module weighing less than 34,000 lb. and offering, in addition to station-keeping requirements, an experimental capability of 1,650 cu. ft. of volume and two kw of power. For the initial mission, the module is launched, unmanned, into a low-inclination orbit near the Earth by the Saturn IB; it is initially manned, and subsequently resupplied, by a command ferry-resupply logistics system, consisting of an Apollo command module, a cargo module, and a Saturn IB launch vehicle.

A67-81178
RESPIRATORY AND CARDIOVASCULAR RESPONSES TO MODERATE EXERCISE AT MID-ALTITUDE.
M. Terzioğlu, N. Gökhan, and A. Kayserilioğlu (Istanbul U., Fac. of Med., Inst. of Physiol., Turkey).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1,2,3, 1966, p. 35–48. 19 refs.

In 11 male medical students, pulmonary ventilation at rest and during exercise was studied at sea level and during a stay of 13 days at 1,965 m. altitude. An increase in respiratory minute volume was noted both at rest and during exercise at mid-altitude. The relative contributions of tidal volume and respiratory rate to the observed hyperventilation were estimated. During exercise at 1,965 m. altitude, ventilation increased to a greater extent than at rest. A ventilatory response to the inhalation of 100% oxygen was observed both at rest and during exercise at mid-altitude. The response at rest was proportionately greater than during exercise. Four to five days after descent to sea level, some persistence of hypoxic chemoreceptor drive was noted at rest and to a lesser extent during exercise. During the 13-day stay at mid-altitude, both the pulse rate and systolic pressure at rest increased slightly over the sea level value. The diastolic pressure increased at first and then diminished to about the pre-expedition level within the second week. The most marked changes in diastolic pressure were observed within a few days after the descent to sea level. During a standard exercise test conducted both at sea level and at altitude, variations in the three cardiovascular parameters were estimated. The variations in cardiac rate and systolic pressure suggested an increase in stroke volume during exercise at mid-altitude. Altitude per se seened to have no bearing on the changes in diastolic pressure during exercise.

A67-81179
THE IMMEDIATE EFFECTS OF OXYGEN BREATHING ON THE CARDIO-VASCULAR SYSTEM.
P. Haab (Fribourg U., Dept. of Physiol., Switzerland).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1,2,3, 1966, p. 56–60. 13 refs.

Immediate and delayed effects of pure oxygen breathing on heart rate, cardiac output and mean arterial pressure were measured on anesthetized dogs. Before the administration of pure oxygen the animals breathed air either spontaneously or artificially. In spontaneously breathing dogs, inhalation of pure oxygen induced, within 15–20 sec., a short lasting fall

of the systemic resistance, but no significant change in heart rate. In the artificially ventilated dogs, pure oxygen breathing induced within the same time a more pronounced fall in systemic resistance and an increase in heart rate. These immediate variations of cardiovascular parameters could be accounted for by the removal of a hypoxic stimulus acting on the arterial chemoreceptors. The difference between the variations observed in spontaneously breathing and artificially ventilated animals appears to be due to the variation of pulmonary ventilation occurring in the spontaneously breathing animal at the onset of hyperoxia. Delayed cardiovascular effects of oxygen breathing, i.e. increased systemic resistance and fall in cardiac output and heart rate were the same as previously described and could not be accounted for by the removal of glomic stimulation.

A67-81180
RELATIONSHIP OF AGE TO THE ALVEOLAR-ARTERIAL P_{O_2} GRADIENT DURING HEAVY WORK IN ACUTE AND LIGHT HYPOXIA SIMULATING AN ALTITUDE OF 2750 M [ALTERSABHANGIGKEIT DES ALVEOLO-ARTERIELLEN P_{O_2}-GRADIENTEN WAHREND SCHWERARBEIT IN AKUTER, LEICHTER HYPOXIE, ENTSPRECHEND 2750 mii. M].
M. Scherrer (U. Bern, Med. Klin., Switzerland).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1,2,3, 1966, p. 61–69. 16 refs. In German.

During heavy work in an altitude of 550 m. above sea level and in an acute hypoxia simulating and altitude of 2750 m., the oxygen tension in the arterial blood of 20 yr.-old athletes dropped from 86 to 64 mm. mercury, in 50 yr.-old men however it dropped from 82 to 54. The difference is in relation to the age and is tatistically significant. The lack of O_2 in the arterial blood attributed to the age can be evaluated at 5% of the saturation, which means a further decrease of the arterial O_2 saturation from 91 to 86%.

A67-81181
THE PRIMATE CIRCADIAN RHYTHM DURING ISOLATION.
T. E. Levere (Henry Ford Hosp., Dept. of Neurol. and Psychiat., Detroit, Mich.).
Psychonomic Science, vol. 7, Mar. 5, 1967, p. 229–230. NASA Grant NASr-83.

The present study presents the measurement of the primate circadian rhythm as it occurs in constant environmental conditions during a 90-day period of isolation in a nemestrine monkey. The major findings indicate that the recorded physiological and behavioral activity followed a 23-hr. periodicity when stimulus change was minimized. Bar-press performance and pulse rate were used as measures of activity.

A67-81182
RESEARCH APPROACHES TO ALLEVIATION OF AIRPORT COMMUNITY NOISE.
H. H. Hubbard, D. J. Maglieri, and W. L. Copeland (NASA, Langley Res. Center, Langley Sta., Hampton, Va.).
(Brit. Acoust. Soc. on Aircraft Noise, Inaugural Meeting, London, May 5–6, 1966).
Journal of Sound and Vibration, vol. 5, Mar. 1967, p. 377–390. 11 refs.

The problem of noise in communities near commercial airports due to landing and take-off operations were discussed, and a description of some of the related NASA sponsored research toward its alleviation was included. The objectives of the paper were to identify some of the significant factors involved, and to present pertinent research information from NASA in-house and contract studies. Data were included to illustrate the significance of such factors as aircraft engine type, compressor configuration, nacelle location and design, power reductions during climbout, steep angle landing approach profiles, and compatible land usage, with regard to noise alleviation and human response implications. Data relating to noise reduction at the source, aircraft design and operational factors, and community consideration were briefly discussed.

A67-81183
THE AVIATION NOISE PROBLEM.
C. B. Pattarini (Port of N. Y. Authority, New York City).
(Brit. Acoust. Soc. on Aircraft Noise, Inaugural Meeting, London, May 5–6, 1966).
Journal of Sound and Vibration, vol. 5, Mar. 1967, p. 370–376.

John F. Kennedy International Airport, one of the three major aviation facilities operated by The Port of New York Authority, handles 75% of all U.S. traffic to and from Europe. The Port Authority is closely involved with the noise problem and devised the concept of "perceived noise decibels" (PNdB) as a measure of annoyance. Aircraft operating at Port Authority airports may not exceed 112 PNdB maximum, and the Port Authority proposes that noise abatement be considered in the design and manufacture of aircraft, as the ultimate source and solution to the problem. The Authority also proposes that noise control be included among the licensing requirements of aircraft.

A67-81184
ACCEPTABILITY OF AIRCRAFT NOISE.
K. D. Kryter (Stanford Res. Inst., Menlo Park, Calif.).
(Brit. Acoust. Soc. on Aircraft Noise, Inaugural Meeting, London, May 5–6, 1966).
Journal of Sound and Vibration, vol. 5, Mar. 1967, p. 364–369. 7 refs.

The problems related to criteria of acceptability of aircraft noise in a community are challenging and require the application of many scientific disciplines and arts, including political and economic ones, before they can be settled for the best interest of man and his society. The problems deserve urgent attention because it is indicated that they will become worse rather than better as aviation progresses. It should appear that present-day knowledge about the generation, measurement and effects of noise on man are sufficiently advanced or nearly so, to allow the specification of the exposures to aircraft noise that might be considered socially acceptable.

A67-81185
AIRCRAFT NOISE AND THE SITING OF A MAJOR AIRPORT.
F. L. Sawyer (Board of Trade (Civil Aviation Dept.), Aviation Operational Res. Branch, London, Great Britain).
(Brit. Acoust. Soc. on Aircraft Noise, Inaugural Meeting, London, May 5–6, 1966).
Journal of Sound and Vibration, vol. 5, Mar. 1967, p. 355–363. 5 refs.

A discussion is given of how aircraft noise affects the siting of a major airport. The main conclusion is the obvious one that the continued problem of aircraft noise necessitates choice of an essentially rural, rather than urban, site. As aircraft noise has now become, and could remain, socially unacceptable, there is an overwhelming need to reduce it.

A67-81186
LOUDNESS AND PITCH SENSATIONS OF AN IMPULSIVE SOUND OF VERY SHORT DURATION.

C. G. Rice and E. E. Zepler (U., Inst. of Sound and Vibration Res., Southampton, Great Britain).
Journal of Sound and Vibration, vol. 5, Mar. 1967, p. 285–289.

From the measured waveform caused by firing a pistol shot in anechoic listening conditions, theoretical evaluations of the absolute loudness and pitch sensations have been investigated. Experimental results give support to the method of evaluation used and show that, for short duration transient sounds, the ear integrates the weighted sound energy to form a loudness judgment.

A67-81187
CHANGES IN THE CONTENTS OF FREE ACETYLCHOLINE IN THE LIVER OF RATS EXPOSED TO HIGH ENERGY PROTONS, GAMMA RAYS AND FISSION NEUTRONS [IZMENENIE SODERZHANIIA SVOBODNOGO KHOLINA V PECHENI KRYS, OBLUCHENNYKH PROTONAMI VYSOKIKH ENERGII, GAMMA-LUCHAMI I NEITRONAMI DELENIIA].
IU. B. Kudriashov and O. S. Arutiunova.
Biologicheskie Nauki, no. 2, 1967, p. 58–60. 6 refs. In Russian.

The experiments on rats irradiated with various doses of high energy protons, neutrons and gamma rays showed that equivalent doses regardless of the type of radiation produced the same degree of change in the choline content of liver. These changes had a phasic character. In the first 24 hr. the choline concentration exceeded the normal. However, 24–48 hr. after the exposure the amount fell below normal. When the radiation sickness lasted over two wk. the third phase occurred when the choline concentration rose again.

A67-81188
ON THE PROTECTION OF THE LENS OF MICE AGAINST IONIZING RADIATION WITH AID OF MERKAMINE DISULFIDE [O ZASHCHITE KHRUSTALIKOV MYSHEI OT IONIZIRUIUSHCHIKH IZLUCHENII S POMOSHCH'IU DISUL'FIDA MERKAMINA].
I. F. Sedlovets, V. A. Kozlov, and V. V. Popov.
Biologicheskie Nauki, no. 1, 1967, p. 67–70. 9 refs. In Russian.

Examination of lenses of the mice subjected to Co^{60} irradiation disclosed that preliminary to the exposure injections of merkamine disulfide did not protect the eye lens from the radiation injury, while it was effective for the entire organism. The reason for this lack of protection may be in the absence of nerves and vessels in the lens tissue. It is known that the velocity of drug propagation through the tissue aids in the accumulation of radioprotector in a particular locus in sufficient quantity to be effective in case of radiation exposure.

A67-81189
THE RELATIVE ROLES OF THE AORTIC AND CAROTID SINUS NERVES IN THE RABBIT IN THE CONTROL OF RESPIRATION AND CIRCULATION DURING ARTERIAL HYPOXIA AND HYPERCAPNIA.
J. P. Chalmers, P. I. Korner, and S. W. White (New South Wales U., School of Physiol., Sydney, Australia).
Journal of Physiology, vol. 189, Feb. 1967, p. 435–450. 42 refs.
Natl. Heart Found., Australia, Life Insurance Med. Res. Fund, Australia and New Zealand, and Australian U. supported research.

The respiratory and circulatory effects of graded arterial hypoxia, alone or with superadded hypercapnia, were studied in unanaesthetized rabbits including normal animals and those with selective section of the aortic nerves, selective section of the carotid sinus nerves, and section of both sets of nerves. When measured two to four days after selective section of the carotid sinus nerve, the resting respiratory minute volume and arterial P_{O_2} were lower and the P_{CO_2} higher than normal. These effects were not observed after selective section of the aortic nerves. Selective aortic nerve section and selective carotid sinus nerves section each produced a similar increase in the resting arterial pressure and heart rate, but were without effect on the resting cardiac output. During arterial hypoxia reflex respiratory and circulatory effects ascribable to arterial chemoreceptor stimulation (hyperventilation, bradycardia, vasoconstriction) were mediated for the most part through the carotid sinus nerve. In animals with only the aortic nerves intact the circulatory response was determined largely by the opposing effects of aortic baroreceptor reflexes and the local peripheral dilator action of hypoxia. The circulatory effects of hyperventilation induced by hypercapnia during arterial hypoxia in animals with both aortic and carotid sinus nerves cut were small. The results suggest that relatively few chemoreceptor fibres originate from the aortic region in the rabbit, though the carotid sinus and aortic nerves both contain baroreceptor fibres. In the rabbit, almost all chemoreceptor fibers run in the carotid sinus nerve.

A67-81190
APPARENT MODIFIABILITY OF RECEPTIVE FIELDS DURING ACCOMMODATION AND CONVERGENCE AND A MODEL FOR SIZE CONSTANCY.
Whitman Richards (Mass. Inst. of Technol., Psychol. Dept., Cambridge).
Neuropsychologia, vol. 5, Feb. 1967, p. 63–72. 14 refs.
NASA Grant NsG 496 and Grant NIGMS MH05673.

A fixation field was presented to both eyes in a stereotachistoscope, and a test flash was presented to the fovea of the right eye. The data obtained was plotted on a log scale of threshold density (I) vs. test field diameter (D). The size of Ricco's summation area can be altered by changing accommodation and convergence (A-C). For foveal stimuli of fixed retinal size, the change in Ricco's area is approximately the same as the change in apparent size induced by the A-C factors. As distance from the foveola increases, the A-C effect becomes smaller. However, size constancy is also rapidly lost outside the fovea. Therefore, the changes in Ricco's area and size constancy seem to be correlated for at least two parameters, namely A-C factors and retinal position. Assuming that the Ricco area reflects receptive field size, the effects of retinal position and A-C factors on the Ricco area suggest a model for size constancy.

A67-81191
HUNGER IN MAN: COMPARATIVE AND PHYSIOLOGICAL STUDIES.
Eliot Stellar (Pa. U., Philadelphia).
(Eastern Psychol. Assn., New York, Apr. 1966).
American Psychologist, vol. 22, Feb. 1967, p. 105–117. 13 refs.
Grant PHS MH-3571.

An attempt was made to uncover the major factors which control feeding and drinking and to learn how they work together to yield behavior that can be measured. Ingestion behavior of rats was investigated, and the roles of oral and

postingestional factors were studied in both the rat and man. Both rats and human subjects ate and drank in bursts and then rested, decreasing the bursts and increasing the rests as satiation developed. Preference-aversion functions can be a matter of taste or of postingestional factors. Results indicated postingestional mechanism was stronger than the oral mechanism. It was shown that objective study of feeding behavior in man is possible and human feeding can be reduced to a basic, physiological, regulatory response. Hunger and thirst are under the control of a number of physiological factors, contributing to a central neural integrating mechanism that yields the physiological regulation, the motivational control, and perhaps the subjective experience.

A67-81192
PHYSIOLOGICAL INDIVIDUALITY.

Frederick Sargent, II and Karla P. Weinman (Ill. U., Dept. of Physiol. and Biophys., Urbana).

Annals of the New York Academy of Sciences, vol. 134, Feb. 28, 1966, p. 696–720. 38 refs.
Grant NIH A-4210.

Physiological individuality was studied using both field and laboratory methods on human volunteers in hot or cold environments. The subjects were divided into various nutritional groups and were subjected to a variety of nutritional and physical stresses designed to provoke the mechanisms of physiological regulation. Measurements were made of the variability of chemical properties of the internal environment and of organ functions. Physiological individuality is a fundamental characteristic of human variability. This individuality is present in the configurations of chemical and physical properties of the internal environment, in the functional tempo of organs and systems, and in the patterns of physiological responses to environmental change. It is reasonable to presume that individuality has a genetic basis. Individuals utilize similar homeostatic mechanisms to achieve comparable adaptive responses, but each draws on quantitatively different configurations of component regulatory processes.

A67-81193
ADAPTIVE MECHANISMS IN HUMANS.

Jacques Leblanc (Laval U., School of Med., Dept. of Physiol., Quebec City, Canada).

Annals of the New York Academy of Sciences, vol. 134, Feb. 28, 1966, p. 721–732. 40 refs.
Grant CDR 9310-79.

All stressing conditions or environments are opposed by specific and nonspecific reactions. The reactivity to all types of stress depends on individual characteristics. Evidence of improving resistance to cold by adaptation has been seen in studies on the Lapps, the Australian Aborigines, Eskimos, and other such groups. Evidence of locally-induced cold adaptation has been obtained on Gaspe fishermen by using cold pressor tests, anxiety tests, and a combination of both. Measurements were made of systolic blood pressure and skin temperature and compared to those of control groups. Specific reactions may show adaptive tendencies as acclimatization is developed. Nonspecific reactions to stimuli are primarily identified with responses of the autonomic nervous system; individual characteristics play a part in intensity of responses and adaptation is due to a central nervous system action identified as habituation. Habituation is possibly the most important means of adaptation in humans as it almost completely abolishes responses to stress and confers a remarkable quality of duration to this phenomenon. In habituation pain sensation as well as vasomotor reactions are greatly reduced. All the mechanisms of adaptation minimize the responses of the organism and consequently broaden homeostasis.

A67-81194
VARIATION IN HEAT PRODUCTION DURING ACUTE EXPOSURES OF MEN AND WOMEN TO COLD AIR OR WATER.

E. R. Buskirk (Pa. State U., Lab. for Human Performance Res. Inst. for Sci. and Eng., University Park).

Annals of the New York Academy of Sciences, vol. 134, Feb. 28, 1966, p. 733–742. 51 refs.
Grant NIAMD AM08311.

Man's metabolic response to cold is discussed, and the wide variation in results which have been achieved in studies on this topic are illustrated. There are many factors which may effect metabolic response, but one major factor is peripheral insulation. The presence of subcutaneous adipose tissue as an insulator has been amply documented. "True" metabolic response to cold is difficult to establish because of metabolic artifacts. In studies of this type, several important factors to be considered are: (1) individual variation; (2) type of cold exposure; and (3) type of artificial insulation used. By recognizing the variability that exists and related problems, it is hoped that future studies may be better designed.

A67-81195
EFFECTS OF PHYSIOLOGICAL AND CLINICAL FACTORS ON RESPONSE TO HEAT.

Douglas H. K. Lee and Austin Henschel (PHS, Div. of Occupational Health, Cincinnati, Ohio).

Annals of the New York Academy of Sciences, vol. 134, Feb. 28, 1966, p. 743–749.

A method for presenting the effects of a large number of variables affecting human activity in hot environments was discussed. Three sets of variables were involved in the evaluation of effects: (1) environmental conditions; (2) human factors; and (3) criteria of effect. The number of factors were reduced for effective handling by introducing a general equation for thermal factors (the ratio between the rate of evaporation needed to compensate for the environmental interference with heat balance and the maximum rate at which evaporation could take place from a completely wet skin under those environmental conditions) followed by the reduction of the equation to only two variables. The third step was the correction for nonstandard values of other variables, the fourth step was the significance for the "standard" person, and the fifth step involved the significance for the nonstandard person. At each step charts and tables were compiled. Use of the scheme consists of three steps: (1) determination of adjustment to air temperature needed to compensate for nonstandard values of metabolic rate, air movement, radiant heat, or clothing; (2) using the adjusted value for air temperature to read the corresponding value of relative strain from the appropriate chart; and (3) from the chart of effects appropriate to the persons under consideration, reading off the probable effects indicated for the value of relative strain.

A67-81196
COMPARATIVE ANALYSIS OF THE PHYSICAL FITNESS OF MEN FOR EXERCISE DURING OXYGEN DEFICIENCY AND DURING ACCELERATION [VERGLEICHENDE UNTERSUCHUNGEN DER KORPERLICHEN LEISTUNGSFAHIGKEIT DES MENSCHEN BEI MUSKELARBEIT, IM SAUERSTOFFMANGEL UND BEI BESCHLEUNIGUNG].

K. E. Klein, H. Brüner, J. Eichhorn, Kl. Schalkhauser, J. Schotte, E. D. Voigt, and H. M. Wegmann (Deut. Versuchsanstalt für Luft- und Raumfahrt e. V., Inst. für Flugmed., Bad Godesberg, West Germany).

(Intern. Congr. of Physiol. Sci., XXIII, Kyoto, Japan, Sep. 13–17, 1965).

Internationale Zeitschrift fur angewandte Physiologie, vol. 22, Jul. 8, 1966, p. 190–206. 49 refs. In German.

Physical fitness for exercise and tolerances to hypoxia (287 mm. Hg) and acceleration ($+G_z$) were evaluated in 20 healthy male students (21–28 yr), which were physically untrained and not adapted to unusual environment. A very close correlation ($r = +0.78$) was found for the true maximal oxygen uptake (V_{O_2max}) and the aerobic capacity estimated from the heart rate during submaximal exercise. From some step tests only the Harvard index showed a moderate correlation ($r = +0.35$) to the V_{O_2max}. The V_{O_2max} was nearly independent from hypoxia and acceleration tolerances, whereas the results of the step tests uniformly revealed negative dependences ($r = -0.41$ to -0.64) on the stress tolerances, with the one exception of the Schneider index, which correlated positively ($r = +0.41$) with the acceleration tolerance. Negative correlations ($r = -0.46$ to -0.60) were also computed between the different criterias for hypoxia and acceleration tolerance. "Physical efficiency" proved to be an inhomogeneous characteristic, which cannot be predestinated by "fitness" tests under exercise alone, but has to be evaluated by a test-battery combined in regard to each specific task.

A67-81197

A RADIOAUTOGRAPHIC STUDY OF PROLIFERATION IN BROWN FAT OF THE RAT AFTER EXPOSURE TO COLD.

Thomas E. Hunt and Eleanor A. Hunt (Ala. U., Med. Center, Birmingham).

Anatomical Record, vol. 157, Mar. 1967, p. 537–545. 16 refs.

Grant NIAMD 04921.

Radioautographs of the interscapular brown fat of six wk. old rats showed that within 24 hr. after cold exposure at 4°–5°C., proliferation increased in endothelium of the already profuse capillary network and also that of arterioles and venules. This continued at a high level for 48 hr. then declined. Extravascular fat precursor cells, but not fat cells, showed an increased proliferative activity at 48 hr. cold exposure which continued until 96 hr. By eight days, adaptation to the cold occurred and proliferative activity was not increased thereafter nor did it occur significantly in animals seven months old. Animals exposed to cold 48 hr. given thymidine H^3, and then returned to a temperature of 23°C. for a week or more showed a considerable number of labeled fat cells which presumably were precursor cells when the thymidine-H^3 was given. When the interscapular brown fat was denervated on one side, there was no loss of lipid nor increased proliferative activity in the vascular or extravascular cells on that side after 48 hr. cold exposure. The normally innervated opposite side, however, had more proliferating cells than usual, especially in the endothelium.

A67-81198

MEDICAL, SURGICAL AND OTHER CONSIDERATIONS IN SELECTING AIRLINE PASSENGERS AND HEALTH HAZARDS IN AVIATION.

B. B. Dotto.

Current Medical Practice, vol. 11, Jan. 1967, p. 1–18.

Medical aspects of judging air travel fitness were presented, and the importance of pre-flight medical examination was stressed. The effects of various factors such as acceleration, hypoxia, dysbarism, etc. were given, and suggestions for prevention or medication were suggested. An outline of several diseases and impairments was given with the suitability of air travel for persons suffering from them.

A67-81199

THE EFFECT OF ALTITUDE ON PERFORMANCE CAPACITY [DIE WIRKUNG DER HOHE AUF DIE LEISTUNGSBEREITSCHAFT].

E. Grandjean (ETH, Inst. für Hyg. und Arbeitsphysiol., Zürich, Switzerland).

Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1, 2, 3, 1966, p. 155–158. 5 refs.

Results of a study during a stay at 3,400 m. altitude showed decreases in the stimulation threshold of pressure sensitivity of the skin, of sensory thresholds, and of the patella tendon reflex. The variations could be cancelled by oxygen. During a three wk. stay at 1,750 m. altitude, the following variations were noted in eight healthy subjects: (a) the average alveolar CO_2 tension was reduced about 4.6 mm. Hg; (b) the maximal respiration pause time showed a decrease of about 13 sec.; (c) the heart frequency was increased during the first wk.; (d) the stimulation threshold of pressure sensitivity of the skin showed an insignificant decrease, and the patella tendon reflex was significantly reduced; (e) mechanical measurement of muscle resistance against passive movement showed a progressive decrease during the stay at altitude. Acclimatization to an altitude of 1,700 m. was accompanied by an increase of the excitability of vegetative and animal functions. This increase probably indicates an alteration which can be interpreted as an increase of the motivation toward performance.

A67-81200

EFFECTS OF HYPOCAPNIA AND HYPERCAPNIA ON INTRACELLULAR ACID-BASE EQUILIBRIUM IN MAN.

Felice Manfredi (Ind. U., School of Med., Dept. of Med. and Veterans Admin. Hosp., Cardiopulmonary Lab., Indianapolis).

Journal of Laboratory and Clinical Medicine, vol. 69, Feb. 1967, p. 304–312. 19 refs.

Grants NINDB B-3231 and NINDB HE 08788; Natl. Tuberc. Assn. supported research.

Knowledge of the manner in which cells respond to extracellular alkalosis and acidosis is essential to the understanding of clinical acid-base disorders. Using the DMO method, intracellular "mean" $[H^+]$ and "apparent" $[HCO_3]$ were determined in five normal subjects at rest, during acute steady state respiratory alkalosis, and during acute steady state respiratory acidosis. In extracellular water, at the three mean levels of CO_2 tensions investigated (19 ± 2, 40 ± 3, and 56 ± 2 mm. Hg), the $[H^+]/pCO_2$ relation was described by a straight ascending line ($[H^+]=0.64\ pCO_2+12.5$; $r=0.99$), and the concentration of bicarbonate could be described by a curvilinear, slowly ascending line. In intracellular water, at low CO_2 tension, the "mean" hydrogen ion concentration and the "apparent" bicarbonate concentration varied in the same direction as, and by a magnitude proportional to, the corresponding extracellular $[H^+]$ and $[HCO_3^-]$ changes; at high CO_2 tension the "mean" hydrogen ion concentration varied in the same direction as, and by a magnitude seven times greater than extracellular $[H^+]$, while "apparent" bicarbonate concentration remained unchanged. These data indicate that acute steady states of hypocapnia and hypercapnia, comparable in degree to those frequently

encountered clinically, are characterized, respectively, by intracellular alkalosis proportional to the observed extracellular alkalosis, and by intracellular acidosis more marked than the observed extracellular acidosis.

A67-81201
REGULATION OF ATTENTION TO COMPLEX DISPLAYS
William A. Johnston, William C. Howell, and Myron M. Zajkowski (Ohio State U., Columbus).
Journal of Experimental Psychology, vol. 73, Mar. 1967, p. 481–482.
Contract AF 30(602)-3622.

Eight observers monitored an 8×8 matrix for 200 min. and detected additions and deletions of alpha-numeric stimuli. One-half the stimuli contained the same number (similar stimuli) and one-half contained different numbers (dissimilar stimuli). Detection latencies were shortest for additions of similar stimuli and longest for deletions of dissimilar stimuli. Vigilance effects were confined to dissimilar stimuli: a decrement and end spurt for deletions, a compensatory increment and terminal decline for additions. The notion that signals reinforce direction of attention was supported.

A67-81202
REINFORCING EFFECT OF AN INFORMATIVE STIMULUS THAT IS NOT A POSITIVE DISCRIMINATIVE STIMULUS.
Derek P. Hendry (Ill. U., Chicago Circle) and John N. Coulbourn.
Psychonomic Science, vol. 7, Mar. 5, 1967, p. 241–242. 5 refs.
NASA Grant NsG 189-61 and Grant PHS GM-14221.

Experiments using pigeons were designed to distinguish discriminative and informative functions of a stimulus and to show if the informative stimulus was a conditioned reinforcer. It was concluded that a stimulus associated with non-reinforcement is reinforcing when it predicts reinforcement.

A67-81203
THE EFFECT OF HUNGER ON THE THRESHOLD OF BEHAVIORAL AROUSAL.
Robert C. Bolles (Wash. U., Seattle) and Mary Sue Younger (Va. Polytech. Inst., Blacksburg).
Psychonomic Science, vol. 7, Mar. 1967, p. 243–244.
NASA Grant NSG-396.

The threshold of behavioral arousal in the rat was measured by presenting a series of bursts of noise of increasing intensity, and observing the animal's behavior. Such thresholds were found to be related to ongoing behavior, history of testing, and conditions of deprivation. A single severe deprivation had no effect upon the threshold but regularly scheduled feeding lowered it.

A67-81204
BAIT-SHYNESS: A TEST FOR TOXICITY WHEN N=2.
John Garcia, Frank R. Ervin, and Robert A. Koelling (Harvard Med. School, Boston, Mass.).
Psychonomic Science, vol. 7, Mar. 5, 1967, p. 245–246. 5 refs.
NASA Contract NsG 262-63, Grants NIH NBI-EP TI-5406, NIH CA-07368, and NIH K3-MH-19434.

Bait-shyness in rats induced by conditional pairing of a gustatory stimulus and injections of a test drug is a simple test for toxicosis requiring only a small N. Tests with injections of a nitrogen mustard derivative indicate that the slope of the acquisition curve is related to magnitude of dose and that the maximal response can be obtained most reliably after a large dose in a single trial.

A67-81205
EFFECTS OF CHLORPROMAZINE, SECOBARBITAL AND SLEEP DEPRIVATION ON ATTENTION IN MONKEYS.
Allan F. Mirsky and Susana Bloch (Boston U., Med. Center, Div. of Psychiat., Mass.).
Psychopharmacologia, vol. 10, Mar. 1967, p. 388–399. 14 refs.
Grants NSF G-21382, NIMH MH-10324, NIMH K3-MH-14,915, and FFRP 61-241.

In order to develop a method for studying sustained attention in the monkey, animals were trained to perform a rapid, serially-presented visual discrimination task. Two versions of the task were developed, one dependent upon shock avoidance, the other on water reward. The effects of varying doses of chlorpromazine (0.075 to 0.6 mg./kg.) and of seco-barbital (5 to 25 mg./kg.) were studied; the shock avoidance task was also used to measure the effects of continuous work-sleep deprivation for periods up to 48 hr. The results suggest that the task is a useful and reliable measure of attentive behavior and that there are similarities between the monkey attention task and the procedures designed to study attention in man; chlorpromazine produced more impairment in performance than seco-barbital; impairment was manifested chiefly in increased errors of omission; chlorpromazine and sleep deprivation seem to share certain common effects which distinguish them from seco-barbital. No marked differences in drug effects were found between the water and shock versions of the task. The relation between these findings and those obtained in human subjects were discussed.

A67-81206
CENTRAL HEMODYNAMICS DURING EXERCISE.
L. G. Ekelund and Alf Holmgren (Karolinska sjukhuset, Clin. Physiol. Dept. and Hosp. for Infectious Diseases, Clin. Physiol. Lab., Stockholm, Sweden).
Circulation Research, vol. 20, Suppl. 1, Mar. 1967, p. I-33–I-43. 26 refs.
Swed. Natl. Assn. Against Heart and Lung Diseases supported research.

The relationships between hemodynamic variables and the effect of factors such as work load duration of exercise, body position, state of fitness, and age were investigated. Experiments were carried out on the bicycle ergometer on three groups of subjects composed of young men and women, old men and trained cyclists. Data were presented in terms of the Fick equation. A linear relationship between cardiac output and oxygen uptake was illustrated. The effects of hard physical training, body position, age, etc. on this relationship were presented. Variations in arterio-mixed venus oxygen difference, heart rate and stroke volume with oxygen uptake were also presented. Variations of right ventricular pressures, systolic pressure gradient, pulmonary arterial pressures, and systemic arterial pressures with cardiac output were shown.

A67-81207
CARDIOVASCULAR RESPONSES TO SUSTAINED (STATIC) CONTRACTIONS.
K. W. Donald, A. R. Lind, G. W. McNicol, P. W. Humphreys, S. H. Taylor, and H. P. Staunton (Edinburgh U., Dept. of Med., Natl. Coal Board Physiol., Great Britain).
Circulation Research, vol. 20, Suppl. 1, Mar. 1967, p. I-15–I-30; discussion, p. I-31–I-32. 34 refs.

The existence of a cardiovascular reflex which causes an unexpectedly high rise of blood pressure in response to sustained contractions was demonstrated. Systematic examinations were made of blood flow through the forearm over a

wide range of tensions held to fatigue. Measurements were made of various physiological indices. At low tensions blood flow through contracting muscles was sufficient for all metabolic needs. Cardiovascular response depended both on the duration of the contraction and on the tension exerted. At tensions above 15% maximal contraction (MVO), this blood flow through the contracting muscles was inadequate to meet metabolic needs. When two or more muscle groups were involved in contractions simultaneously, the response was not additive. The usual responses to a reflex demand for an elevation of blood pressure elicited by static exertion was an increase in cardiac output due to an increase in heart rate. With rhythmic or dynamic exercise the increase of the work load of the myocardium was due to an increase of flow but little elevation of blood pressure. With sustained contractions there was some increase in flow load and a considerable increase in pressure load. Relatively moderate and localized isometric work can cause an abrupt increase of myocardial work with a far higher pressure component than in dynamic work. This acute ventricular load and increase of intravascular pressures may be unexpectedly dangerous to a person with a compromised heart or impaired integrity of the arterial wall.

A67-81208
AN ANALYSIS OF THE CARDIAC RESPONSE TO EXERCISE.

Eugene Braunwald, Edmund H. Sonnenblick, John Ross, Jr., Gerald Glick, and Stephen E. Epstein (Natl. Heart Inst., Cardiol. Branch, Bethesda, Md.).

Circulation Research, vol. 20, Suppl. 1, Mar. 1967, p. I-44–I-58. 36 refs.

A series of experiments designed to elucidate the role of the heart rate, of the sympathetic nervous system, and of the Frank-Starling mechanism in the cardiac response to exercise were reviewed. During spontaneous, uncontrolled exercise carried out in the supine position, the increase in cardiac output always results almost exclusively from an increase in heart rate, while the contribution made by augmentation of the stroke volume is variable and dependent on the subject's posture and the intensity of the exercise. When heart rate is increased in the resting subject, cardiac output remains relatively constant, and stroke volume and ventricular end diastolic and end-systolic dimensions decrease. When exercise is carried out at a constant heart rate, the evaluation of cardiac output results entirely from an augmentation of stroke volume, ventricular end-diastolic dimensions increase, and considerable improvement of the myocardial force-velocity relation occurs. The infusion of a β-adrenergic stimulant, isoproterenol, raises cardiac output, reduces ventricular end-diastolic and end-systolic dimensions and increases the velocity of myocardial fiber shortening. The β-adrenergic blockade reduces the cardiac output which can be achieved during maximal exercise, prevents the reductions of ventricular dimensions, and blocks, in part, the augmentation of the velocity of myocardial fiber shortening which ordinarily occurs during exercise.

A67-81209
BEHAVIOR OF RESISTANCE AND CAPACITY VESSELS IN HUMAN LIMBS DURING EXERCISE.

John T. Shepherd (Mayo Clinic and Mayo Found., Sect. of Physiol., Rochester, Minn.).

Circulation Research, vol. 20, Suppl. 1, Mar. 1967, p. I-70–I-81; discussion p. I-81–I-82. 69 refs.

Present knowledge of the dilation of resistance vessles in active muscles during exercise was reviewed, and the contribution of the changes in limb circulation to total cardiovascular adaptations to exercise was discussed. Studies of the resistance vessles of active muscles and of non-exercising limbs were presented as well as studies of the changes in capacity vessels in limbs during exercise. The integrated role of resistance and capacity vessels with cardiac output and blood pressure regulation during exercise was also discussed. It was suggested that in the capacity system the peripheral veins act more strongly than the proximal ones to a reflex stimulus, and the capacity system as a whole is well equipped to move blood centrally. Unlike the capacitance vessels, the resistance vessels are governed by local factors, but their over-all activity is regulated by the autonomic nervous system. The receptors and afferent pathways concerned in this reflex increase in tension of the smooth muscle in the capacitance and resistance systems with exercise are unknown.

A67-81210
CONTRAST INTERPRETATION OF BRIGHTNESS CONSTANCY.

Robert B. Freeman, Jr. (Pa. State U., University Park).

Psychological Bulletin, vol. 67, Mar. 1967, p. 165–187. 46 refs.
Grants NIH MH-08856 and NIH MH-10,691.

Several interpretations of brightness constancy in terms of simultaneous contrast and their supporting experimental evidence are reviewed. Brightness constancy is defined in terms of the luminance relationships of stimulus conditions. The various contrast theories of brightness constancy and their concomitant definitions of "contrast" offered by Hering, Helson, Jameson and Hurvich, Heinemann, Diamond, Leibowitz, and Wallach are presented. The results of recent investigations of simultaneous contrast are described, and compared with the results of brightness-constancy experiments. True brightness constancy, as an ideal case, is rarely obtained experimentally, obviating the necessity for a theory for it. The induced-response theory of Jameson and Hurvich handles many data of brightness-constancy and brightness-contrast experiments with relatively simple mathematical formulation, while at the same time making possible the prediction of those deviations from brightness constancy which were first described by Hering and are still obtained experimentally.

A67-81211
EFFECTS OF VARYING RESPIRATORY WAVEFORMS ON GAS EXCHANGE.

Norman A. Bergman (Utah U., Coll. of Med., Salt Lake City).

Anesthesiology, vol. 28, Mar.–Apr. 1967, p. 390–395. 11 refs.
Grant NHI HE 08543.

Effects of three different respiratory waveforms on magnitude of alveolar-arterial oxygen tension differences (AaD_{O_2}) and physiological dead space were compared during artificial ventilation of healthy anesthetized subjects. Waveforms included two intermittent positive pressure patterns with differing duration of inspiration and one positive-negative pattern. AaD_{O_2} did not vary with use of the different respiratory waveforms, with mean pressure during the respiratory cycle or with duration of inspiration. Physiological dead-space likewise did not change with the varying respiratory waveforms or mean pressure. Physiological dead space increased as duration of inspiration decreased but the change, thought significant, was not dramatic. It was concluded that any respiratory pattern which provided adequate alveolar

ventilation would be efficient in performing the ventilatory functions of oxygenation and carbon dioxide removal. A simple respiratory waveform should be adequate during artificial ventilation of healthy subjects and the provision foi using different respiratory waveforms in apparatus seems unnecessary.

A67-81212
METABOLISM UNDER O_2-DEFICIENCY AT A HIGH ALTITUDE: THERAPEUTIC INFLUENCE OF ACCLIMATIZATION [METABOLISMUS UNTER O_2-MANGEL IN HOHENKLIMA THERAPEUTISCHE BEEINFLUSSUNG DER AKKLIMATISATION].

E. Albrecht and H. Albrecht.

Pflügers Archiv für die gesamte Physiologie, vol. 293, no. 1, 1967, p. 1–18. 54 refs. In German.

The effect of altitude on several metabolic processes was studied in 30 human volunteers ascending Mount Aconcagua in Argentina (23,000 ft.). The changes observed in the acid-base-balance, in liver functions and some other standard examinations are discussed with regard to acclimatization. It was proved that the compensational capacity of the organism at altitudes above 18,000 ft. is limited. At 20,400 ft. the blood-pH tends to be less alkaline than expected. In spite of a respiratory alkalosis the total acid-excretion in uring increases at 20,400 ft. The capacity of the liver for the acetylation of orally administered sulfonamides decreases with increasing altitude. At 20,400 ft. only half of the test-sulfonamide is excreted as an N4-acetylated compound. The SGPT-activity shows a slight increase. Acclimatization and adaptability to altitude could be improved therapeutically by administration of an anabolic steroid in combination with vitamins (Fortabol): as compared to the control group, an intensified hemopoiesis with consecutive increase of the erythrocytes, a much lesser increase of blood-pH, a better capacity of the liver for acetylation, and a significant anticatabolic effect were observed in treated group.

A67-81213
INHIBITION OF VISUAL EVOKED RESPONSES TO PATTERNED STIMULI DURING VOLUNTARY EYE MOVEMENTS.

Elliott G. Gross, Herbert G. Vaughan, Jr., and Edward Valenstein (Albert Einstein Coll. of Med., Saul R. Korey Dept. of Neurol., Bronx, N. Y.).

Electroencephalography and Clinical Neurophysiology, vol. 22, Mar. 1967, p. 204–209. 16 refs.
Grants PHS NB-03356, PHS MH-06723, PHS MH-6418, and PHS 1-K3-NB-31.

Evoked cerebral responses were recorded to brief shifts of patterned stimuli under conditions of constant luminous flux during voluntary eye movements and ocular fixation. Virtually complete suppression of evoked response and perception of the pattern shift occurred during eye movements. In contrast, much dimmer test flashes presented against a dark field were suppressed to a substantially lesser degree. Retinal blur was eliminated as a factor in saccadic suppression, since inhibition was the same for horizontally and vertically oriented patterns. The results indicate that an inhibitory mechanism must exist which is specific for contour shift as opposed to change in luminance.

A67-81214
CHANGES IN ELECTRICAL ACTIVITY OF THE CEREBRAL CORTEX AND OF SOME SUBCORTICAL CENTERS IN HYPERBARIC OXYGEN.

F. S. Rucci, M. L. Giretti, and M. La Rocca (Sassari U., Clin. Chir. and Ist. di Fisiol. Umana, Sardegna, Italy).

Electroencephalography and Clinical Neurophysiology, vol. 22, Mar. 1967, p. 231–238. 11 refs.

The electrical activities of the cerebral cortex and of some subcortical structures were recorded during hyperoxic seizures, to ascertain the structures first fired. Unrestrained, unanesthetized rats were subjected to hyperbaric oxygen by being placed in a hyperbaric chamber at 4 atm. abs. for two–four hr. In some experiments electromyogram from the biceps muscle of the right fore-limb and from posterior cervical muscles were recorded for the duration of the hyperbaric oxygen. A greater incidence of initial seizures was observed during the first hour from the beginning of hyperoxia. The seizures were usually preceded by pre-seizure activity, more evident in the subcortical centers, consisting in increase in voltage and discharge rate and in spindle-like waves. Two different patterns of seizure were observed characterized by different discharge rates and durations. The final part of long-duration seizures (type I) usually exhibited an opposite polarity compared with the initial one. The onset of hyperoxic seizures was simultaneous in all the cortical records. The subcortical leads were usually fired at the same time as the cortex and the process of seizure extinction was invariably simultaneous in the cortical and the subcortical leads. Hyperoxic seizures were also observed in decorticate rats in which the whole cerebral cortex had been removed by suction. This supports the view that the cerebral cortex is not necessary for starting and developing hyperoxic seizures. Author

A67-81215
APPARENT VERTICALITY: PSYCHOPHYSICAL ERROR VERSUS SENSORY-TONIC THEORY.

Daniel C. O'Connell (Harvard U., Cambridge, Mass.), Daniel J. Wintraub (Mich. U., Ann Arbor), Richard G. Lathrop (Chico State Coll., Calif.), and Thomas J. McHale (Milwaukee Inst. of Technol., Wis.).

Journal of Experimental Psychology, vol. 73, Mar. 1967, p. 347–353. 11 refs.
NSF and Ford Found. supported research.

Judgments of verticality have been found previously to deviate systematically from true vertical due to initial tilt of a luminous rod. In Experiment I, starting position did not explain such deviations; subjects exhibited a psychophysical error of anticipation varying directly with number of degrees turned. Sex and handedness proved non-significant. Settings with right and left hands were significantly different-the sole finding in accord with sensory-tonic theory. In Experiment II, two points of light defined a rod (center or end pivoted to obtain angular symmetry or asymmetry). Attention of subjects was directed to one light, in either the right or left half of the visual field (right-left asymmetry). There was not significant effect of angular asymmetry, right-left asymmetry, or their interaction, and therefore no confirmation of sensory-tonic theory. Direction of turn was the sole significant effect: an error of habituation rather than anticipation.

A67-81216
A FACTOR ANALYTIC STUDY OF AUTOKINETIC RESPONSES.

Doris C. Gilbert (Harvard U., Cambridge, Mass.).

Journal of Experimental Psychology, vol. 73, Mar. 1967, p. 354–357. 11 refs.
Grant NIMH 1-FE-MH-28, 985-01.

Results from different methods of measuring the autokinetic phenomenon are not comparable. The present study

presents results of a factor analysis of five response measures of autokinetic movement under the conditions of a moving pinpoint of light and of a stationary light. A three principal-factor structure of the five measures was obtained which highlights the importance of procedural differences between tracing methods and timed-event recording. The results give empirical evidence for the paradoxical fact that some subjects experience the light as moving without the light's spatial displacement.

A67-81217
SELECTIVE ATTENTION AND VERY SHORT-TERM RECOGNITION MEMORY FOR NONSENSE FORMS.
Charles W. Eriksen and Joseph S. Lappin (Ill. U., Urbana).
Journal of Experimental Psychology, vol. 73, Mar. 1967, p. 358–364. 13 refs.
Grants PHS MH-1206 and PHS K5-MH-22,014.

In two experiments subjects received displays containing two or four nonsense forms presented for 125 msec. and followed by a single test form at delays of 0–1,000 msec. The subject judged whether the test form was or was not included among the forms in the display. Four form displays were presented under two conditions, one where directional bar markers directed subjects to the top or bottom pair of forms and another condition where no indicators were present. in the latter condition an indicator occurring at the time of the test form directed the subject to make his decision on the basis of the top or bottom pair of preceding display forms. Recognition was superior at all delay intervals for two-form displays, and four-form displays with the simultaneous indicator were superior to four-form displays where the indicator was delayed until the test form. The results were interpreted in terms of a selective process in visual attention and a masking effect apparent in the data was interpreted in terms of saccadic eye movement.

A67-81218
RETENTION OF HABITUATION OF THE GSR TO VISUAL AND AUDITORY STIMULATION.
H. D. Kimmel (Ohio U., Athens) and A. J. Goldstein (Fla. U., Gainesville).
Journal of Experimental Psychology, vol. 73, Mar. 1967, p. 401–404.
Grant PHS MH-06060-2.

Subjects came to the laboratory on three successive weekly sessions and received repeated presentations of a white light or a 1,000-c.p.s. tone until a criterion of habituation of the galvanic skin response was reached. There was a significant reduction in the number of trials to criterion from session to session for both stimuli, while neither sense modality nor the Modality X Sessions interaction effects were significant. On the first session, habituation was characterized by a drop in response magnitude, followed by some increase, and, finally, an additional drop. The average magnitude of response on the first trial of each session did not reduce significantly from session to session, but the average magnitude of response on the second trial of each session did. The results were interpreted to mean that some retention of habituation from session to session occurred (i.e., there is something "learned" in habituation) and it was conjectured that conditioned inhibition associated with response-produced stimuli might have been responsible for some of the retention effect.

A67-81219
TACTILE SPATIAL AFTEREFFECT OR ADAPTATION LEVEL?
A. J. Gilbert (Western Australia U., Perth).
Journal of Experimental Psychology, vol. 73, Mar. 1967, p. 450–455.
Grant AF-AFOSR-968-65.

A tactile spatial aftereffect from cutaneous stimulation on the anterior surfaces of the forearms was claimed in a recent report. It was demonstrated in the present study that covariation of the stimulators employed to induce the aftereffect and the series of comparison stimuli used in measuring it, confounded the results of the previous experiment and that most of the variance was due to adaptation to the different series. It is suggested also that the remaining variance possibly was not due to tactile stimulation.

A67-81220
INDEPENDENCE IN THE PERCEPTION OF SIMULTANEOUSLY PRESENTED FORMS AT BRIEF DURATIONS.
Charles W. Eriksen and Joseph S. Lappin (Ill. U., Urbana).
Journal of Experimental Psychology, vol. 73, Mar. 1967, p. 468–472. 9 refs.
Grants PHS MH-1206 and PHS K6-MH-22,014.

One to four different forms were presented in a single tachistoscopic exposure under each of three exposure durations. Four practiced subjects were run. The subject attempted to identify each form in the display, designating its position. The results were well described by a concept of perceptual independence which assumes that error factors are uncorrelated for different foveal locations at a point in time and that form stimuli falling on separated foveal areas do not interact.

A67-81221
EFFECT OF HYPOTHERMIA ON CORTICAL EVOKED POTENTIALS.
R. J. Boakes, G. A. Kerkut, and K. A. Munday (Southampton U., Dept. of Physiol. and Biochem., Great Britain).
Life Sciences, vol. 6, Mar. 1, 1967, p. 457–459. 6 refs.

Anesthetized rats were used to measure electroencephalogram (EEG) frequency during hypothermia. The frequency of the EEG activity was decreased as the body temperature fell. The latent period of evoked cortical potentials increased as the body temperature fell. At 25° C. the latent period was twice that at 36°C. The amplitude of evoked potentials reached a peak at 30–31°C.

A67-81222
A GABA-RELATED HYPOTHESIS ON THE MECHANISM OF ACTION OF THE ANTIMOTION SICKNESS DRUGS.
C. E. Giurgea, F. E. Moeyersoons, and A. C. Evraerd (UCB-DIPHA, Res. and Develop. Direc., Pharmacol. Dept. Brussels, Belgium).
(Belgian Physiol. Soc., Ghent, Oct. 22, 1966).
Archives internationales de Pharmacodynamie et de Thérapie, vol. 166, Mar. 1967, p. 238–251. 27 refs.

Using the method of central nystagmus in the awake, unrestrained rabbit, it was shown that interference with serotonin metabolism is equally unrelated to drug efficiency since an antiserotonin drug and $_5$HTP had the same depressant effect on that nystagmus. The hypothesis that active drugs may interfere with the brain gamma amino butyric acid (GABA) system is supported by three arguments: (a) an inhibitor of GABA transaminase was proved to suppress central and vestibular nystagmus; (b) 2-pyrrolidinone, i.e. the cyclized GABA, was equally active while the isomer 3-pyrrolidinone, not closely related to GABA, was ineffective; (c) various

2-pyrrolidinone substitutes were equally effective in depressing central and vestibular nystagmus in rabbit and vestibular nystagmus in man. The recently synthesized ucb 6215, has a peculiar pharmacological profile and may be of neuropharmacological interest.

A67-81223
DISPLAY-SELECTION TECHNIQUES FOR TEXT MANIPULATION.

William K. English, Douglas C. Engelbart, and Melvyn L. Berman (Stanford Res. Inst., Menlo Park, Calif.).

IEEE Transactions on Human Factors in Electronics, vol. HFE-8, Mar. 1967, p. 5–15. 6 refs.

Tests and analysis to determine the best display-selection techniques for a computer-aided text-manipulation system reveal that the choice does not hinge on the inherent differences in target-selection speed and accuracy between the different selection devices. Of more importance are such factors as the mix of other operations required of the select-operation hand, the ease of getting the hand to and gaining control of a given selection device, or the fatigue effects of its associated operating posture. Besides a light pen, several cursor-controlling devices were tested, including a joystick and at Stanford Research Institute (SRI)-developed device known as a "mouse". The study was aimed directly at finding the best display-selection means for the SRI text-manipulation system but generalizations applicable to other types of on-line systems were derived.

A67-81224
LIGHT AND ELECTRON-MICROSCOPIC STUDIES OF STRUCTURAL CHANGES IN THE LUNG OF THE RAT EXPOSED TO HYPERBARIC OXYGEN [LICHT- UND ELEKTRONENMIKROSKOPISCHE UNTERSUCHUNGEN UBER DIE STRUKTURVERANDERUNG DER LUNGE NACH EINWIRKUNG HOHEN SAUERSTOFFDRUCKES].

M. Nasseri, E. S. Bücherl (Stadtischen Krankenanstalten, Chir. Klin., Berlin, East Germany), and J. Wolff (Freie U. Berlin, Forschungsabt. für Elektroenenmikroskop., East Germany)

Virchows Archiv für pathologische Anatomie und Physiologie und für klinische Medizin, vol. 342, Mar. 14, 1967, p. 190–198. 18 refs. In German.

After two to six hr. of hyperbaric oxygen (2–4 atm.), the rat lung shows atelectasis and an interstitial edema, and finally an intra-alveolar edema. These changes depend on the exposure time and the oxygen pressure. Swelling and vacuolization of the endothelial cells occludes the capillaries and leads to precapillary stasis. The plication of alveolar walls and the swelling of the cells, accompanied in part by swelling of the mitochondria, lead to atelectasis. With two and three atm. of oxygen the thickening of the alveolar wall and the increase in the interstitial space become prominent, whereas with four atm. for only two hr. the exudation and transudation into the alveolar spaces predominate. Degenerative changes of the endoplasmic reticulum of fibrocytes, alveolar recess-cells, and macrophages are first found at three to four atm.

A67-81225
LUMINANCE AS A PARAMETER OF THE EYE-MOVEMENT CONTROL SYSTEM.

Leon L. Wheeless, Jr. (Bausch and Lomb, Inc., Rochester, N. Y.) Gerald H. Cohen, and Robert M. Boynton (Rochester U., N. Y.).

Journal of the Optical Society of America, vol. 57, Mar. 1967, p. 394–400. 6 refs.
Grants PHS 2G540 and PHS NB-00624; Bausch and Lomb, Inc. supported research.

A study of the eye-movement control system shows the dependence of many of the system parameters on target luminance and contrast. Saccadic reaction time was found to decrease from a high value toward a fixed minimum as target luminance was increased, whether with a zero background (high contrast) or a fixed low contrast with respect to the background. The magnitude of the visual dead zone created when target luminance went below foveal threshold was also measured as a function of target luminance. The closed-loop gain of the eye-movement control system for $\pm 2^\circ$ sinusoidal target motion was measured as a function of luminance for high- and low-contrast targets. The results showed two changes of system gain as target luminance was decreased: (a) there was a decrease of the high-frequency response associated with target energies (luminance-by-time products) falling below a critical value required to produce visual sensation, resulting in a cutoff frequency; (b) for high-contrast targets only, there was an over-all decrease of system gain as target luminance was decreased, for luminances well above foveal threshold and for frequencies well below cutoff. This latter, unexplained effect cannot be interpreted as resulting from an increase of retinal latency, the effect of a visual dead zone, or the lack of sufficient target energy for visibility. A similar tracking experiment was performed for "unpredictable" target motion. Several changes were observed in the response of the eye-movement control system, and these were related to the effects of luminance upon system parameters and target predictability.

A67-81226
SPATIAL MODULATION TRANSFER IN THE HUMAN EYE.

Floris L. Van Nes and Maarten A. Bouman (Utrecht U., Phys. Lab., Dept. of Med. and Physiol. Phys., The Netherlands).

Journal of the Optical Society of America, vol. 57, Mar. 1967, p. 401–406. 16 refs.

The contrast sensitivity of the human eye for sinusoidal illuminance changes was measured as a function of the spatial frequency, for monochromatic light with wavelengths of 450, 525, and 650 nm. At each wavelength, data were obtained for a number of illuminance levels. All observations were taken at equal accommodation, and corrected for chromatic aberration. If the wavelength-dependent effects of diffraction on the modulation transfer are taken into account, no difference is found between the photopic contrast-sensitivity functions for red, green, or blue. For mean retinal illuminances Bo smaller than 300 td, threshold modulation M at a given frequency is found to increase in proportion to Bo-1/2 (de Vries-Rose law). For Bo greater than 300 td M remains a constant fraction of it (Weber-Fechner law). After separation of the optical modulation transfer of the eye media from the measured psychophysical data, the remaining function can be considered as composed of a neural and a light-diffusion transfer function. The latter can be compared with the analytic transfer function of photographic film.

A67-81227
OPTICAL PERFORMANCE OF THE HUMAN EYE.

R. W. Gubisch (Cambridge U., Physiol. Lab., Great Britain). *Journal of the Optical Society of America*, vol. 57, Mar. 1967, p. 407–415. 44 refs.
U.S. Churchill Found. supported research.

This disagreement between physical and psychophysical estimates of human optical performance is discussed. Recent measurements of the eye's modulation transfer functions in white light for several pupil sizes are used to compare the eye with an ideal optical system in terms of normalized modulation transfer functions, point image profiles, and Strehl ratios. Several simple fundal-image profiles are derived from the measured modulation transfer functions, and the importance of these profiles to psychophysical measurements is discussed. Glare is considered as the extension of point spread functions to large angles; experimental measurements are compared with theories for the special case of an annular target.

A67-81228
SPECTRAL-SENSITIVITY FUNCTIONS FOR HOMOCHROMATIC-CONTRAST DETECTION.
Dwight A. Burkhardt and Paul Whittle (Brown U., Hunter Lab. of Psychol., Providence, R. I.).
Journal of the Optical Society of America, vol. 57, Mar. 1967, p. 416–420. 18 refs.
Grant PHS 5 TINB-5350.

Two methods of measuring foveal spectral sensitivity were compared: (1) the absolute-threshold method and (2) a homochromatic-contrast method. In the second method, the subject saw a fixed-contrast homochromatic stimulus consisting of a steady background field and a superimposed 32% increment flash. The overall radiance level of the stimulus was varied systematically to determine the minimum radiance required to detect the flash. The spectral-sensitivity curve obtained by this method was somewhat narrower than the curve obtained by the absolute-threshold method. The homochromatic-contrast method was also used for a retinal region 8° above the fovea. A curve resembling the common photopic curve was obtained. It is concluded that the homochromatic-contrast method may serve as a useful addition to the standard methods of spectral-sensitivity measurement.

A67-81229
TIMING CONTROL AND FINGER, ARM, AND WHOLE BODY MOVEMENTS.
Joel E. Grose (Sonoma State Coll., Rohnert Park, Calif.).
Research Quarterly, vol. 38, Mar. 1967, p. 10–21. 13 refs.

While physical educators have both a theoretical and practical interest in the ability of the individual to coordinate his movements so that a certain act can be accomplished at exactly the right instant, there has been little research on this problem. The present investigation concerned coincidence response, namely completion of a target-directed motor act at the exact instant that a large-scale laterally-moving target passed a predetermined fixed index. Measurements were made of three types of response movements as well as simple reaction time. The average subject tended to complete the motor act prematurely under the conditions of the experiment. The proportion of common variance between finger, arm, and whole body responses ranged from 16 to 39% while the task specificity of individual differences ranged from 61 to 85%. Coincidence timing accuracy in the finger and the arm task failed to improve with practice under conditions of the experiment.

A67-81230
RELATIONSHIP OF GALVANIC SKIN RESPONSE TO TASK DIFFICULTY, PERSONALITY TRAITS, AND MOTIVATION.
William L. Lakie (Calif. U., Davis).
Research Quarterly, vol. 38, Mar. 1967, p. 58–63. 16 refs.

This study was concerned with the relation of galvanic skin response (GSR) to task difficulty, feeling and emotion, and to motivation. Each of the 39 subjects was asked to make four contractions on a hand dynamometer of specific kilograms, calculated to be 50, 70, 90, and 100% of his maximal contraction. The subjects were categorized by scores on each of the three personality measures, and two subgroups were defined on the basis of scores on the n Ach (French Test of Insight) and the N scale (Neuroticism scale of the Maudsley Personality Inventory). The conclusions were that task difficulty is reflected in GSR scores, with the more difficult tasks associated with a greater rise in GSR; that subjects dichotomized by their scores on each of three personality scales cannot be differentiated by GSR scores; and that subjects scoring high on n Ach and low on the N scale had higher mean GSR scores than subjects scoring high on the N scale and low on the n Ach.

A67-81231
EFFECTS OF d-AMPHETAMINE SULFATE, CAFFEINE, AND HIGH TEMPERATURE ON HUMAN PERFORMANCE.
Bill W. Lovingood, Carl S. Blyth, William H. Peacock, and Robert B. Lindsay (N. C. U., Lab. of Appl. Physiol., Chapel Hill).
Research Quarterly, vol. 38, Mar. 1967, p. 64–71. 18 refs.
Contract DA-49-007-MD-949.

Amphetamine, caffeine, and high ambient temperature (125.6°F.) were compared with placebo to determine their effects on a variety of strength, psychomotor, and mental performance tasks and certain physiological measures of 24 young men who were students at the University of North Carolina. Performance was measured objectively only after each subject had been given standard extensive practice and acclimatization. The study permitted the conclusions that (a) 15 mg. of d-amphetamine sulfate significantly improved performance but caused a significant increase in heart rate, (b) 500 mg. of citrated caffeine did not produce a significant change in either the performance tasks or the physiological parameters measured, and (c) high ambient temperature (125.6° F.) produced a significant improvement in performance.

A67-81232
PRACTICE EFFECTS ON REACTION LATENCY FOR SIMPLE AND COMPLEX MOVEMENTS.
Mary Lou Norrie (Calif. U., Berkeley).
Research Quarterly, vol. 38, Mar. 1967, p. 79–85. 6 refs.

Henry's "Memory Drum" theory of neuromotor reaction was applied to the learning of simple and complex movements having such short duration that feedback in its classical monitoring aspect was excluded. The theory implied that the amount of program simplification and reorganization in the learning of a simple movement is small and occurs early in the practice curve, while that for a more complex movement is larger and requires more practice to reach the limits of simplification. Subjects were college women divided into simple movement and complex movement groups of 51 each. The simple movement involved a forward movement of the arm while the complex movement required subjects to change the direction of the arm movement twice. Each subject had 50 trials on her task. Since according to theory the organization of the neuromotor program takes place before the movement

starts, reaction times were used to indicate time for program organization. Movement time data was also collected. The complex movement group showed a greater shortening of reaction time than the simple movement group. The complex movement group continued to show improvement in reaction time throughout the experiment while the performance curve for the simple movement group leveled off during the first 20 trials. The data supported the implications of the theory.

A67-81233
MENTAL PRACTICE: A REVIEW AND DISCUSSION. PART I.
Alan Richardson (Western Australia U., Nedlands).
Research Quarterly, vol. 38, Mar. 1967, p. 95–107. 43 refs.

Investigations into the process of mentally practicing a perceptual motor skill began about 30 yr. ago. However, there has been a marked increase in the amount of interest in this area of research in the last ten yr. This is the first of two articles, which together aim to present a critical review of work so far completed, possible explanations of the phenomenon, and an indication of the directions that future research might take. In this article the evidence for improvement under conditions of mental practice is reviewed.

A67-81234
A FURTHER EXPERIMENT ON JUDGING THE NOISINESS OF AIRCRAFT IN FLIGHT.
J. M. Bowsher, D. R. Johnson, and D. W. Robinson (Natl. Phys. Lab., Appl. Phys. Div., Teddington, Great Britain).
Acustica, vol. 17, no. 5, 1966, p. 245–267. 8 refs.

A large scale experiment with 148 subjects listening to the sounds of aircraft flying overhead was described. The validity of rating scales in this type of experiment was investigated using four psychologically matched groups of subjects in two different noise environments. The result confirmed an earlier suggestion that subjects form their judgments largely on the basis of the category names of the rating scale rather than merely filling the range of responses provided. Judgments made both indoors and outdoors using criteria of "intrusiveness" and of "noisiness" showed that subjects were strongly influenced by their knowledge of the source of a sound and compensate to some extent for reductions of sound level caused by transmission into a building or by great distances of propagation. There was no marked difference in the appraisal of the noise from an aircraft taking off as opposed to that from one landing.

A67-81235
EXERCISE PERFORMANCE OF ATHLETES AT SEA LEVEL AND 3100 METERS ALTITUDE.
Robert F. Grover (Colo. U., Med. Center, Dept. of Med., Denver) and John T. Reeves (Ky. U., Med. Center, Dept. of Med., Lexington).
Schweizerische Zeitschrift für Sportmedizin, vol. 14, nos. 1, 2, 3, 1966, p. 130–148. 12 refs.
Contract DA-49-193-MD-2551, and Grants PHS HE-8728-02, PHS HE-06780, and PHS HE-29237.

This study examines exercise performance at the altitudes of 300 and 3,100 m. in young men native to these two altitudes. Maximum oxygen uptake ($\dot{V}O_2$) was 26% less at the higher altitude for both groups. The newcomers to the higher altitude showed no change in maximum $\dot{V}O_2$ during 18 days of study. Their performance after return to low altitude was not improved by their sojourn at medium altitude. The impaired performance at medium altitude resulted from limitations of the pulmonary diffusion capacity for oxygen, and also probably from a smaller cardiac stroke volume. Athletically, the young men native to low altitude were superior to those from higher altitude. Consequently, the sea level athletes won all track competitions at both low and medium altitude. However, at medium altitude, running speed was necessarily slower for the longer distance events as a consequence of the reduction in exercise capacity (reduction in maximum $\dot{V}O_2$).

A67-81236
THE EFFECT OF INPUT MODALITY ON SHORT-TERM SERIAL RECALL.
Michael C. Corballis and Thelma Loveless (McGill U., Toronto Canada).
Psychonomic Science, vol. 7, Mar. 15, 1967, p. 275–276. 7 refs.
Grant DRB, Canada 9425-10.

Immediate recall of eight visually presented items was better if the first four were presented fast and the last four slowly (FS Condition) than if the first four were slow and the last four fast (SF Condition), supporting an hypothesis that subjects tend to rehearse cumulatively. Using aural presentation, others have obtained the opposite result, supporting decay theory. These and other results suggest that rehearsal of serially presented information is more efficient and flexible when presentation is visual than when it is aural.

A67-81237
FURTHER PRELIMINARY FINDINGS ON SOME EFFECTS OF VERY FAST SEQUENTIAL INPUT RATES ON PERCEPTION.
M. S. Mayzner, M. E. Tresselt, A. J. Adrignolo, and A. Cohen (N. Y. U., New York City).
Psychonomic Science, vol. 7, Mar. 15, 1967, p. 281–282.

A previous study, employing a computer-based CRT display system, showed that if the visual system is presented with a string of very fast sequential inputs approximately the first half of these inputs will not be perceived if display order is irregular and display input rate is in the range from approximately 10 to 20 msec. per letter and per interval between letters. In the present study, this phenomena called sequential blanking is examined further and the results suggest certain irregular display orders may also give rise to a spatial displacement of one letter away from another in the sequence, and this phenomena has been called sequential displacement.

A67-81238
SHORT-TERM STORAGE OF REPETITIONS OF TWO ITEMS.
Herman Buschke and Howard Lim (Stanford U., Calif.).
Psychonomic Science, vol. 7, Mar. 15, 1967, p. 277–278. 5 refs.
Grants PHS MH-08556, and PHS K3-MH-23, 796.

Correct choice of the more frequent of two items presented in random sequence appears to be a function of the absolute, rather than the relative difference in number of repetitions of the items. When the absolute difference was held constant at one or five repetitions, proportions of correct choices remained constant as sequence length increased (and relative differences decreased), and was greater for an absolute difference of five than one. This suggests that such choice may depend on evaluation of the relative values of independent short-term traces for each item.

A67-81239
THE ROLE OF TASK DIFFICULTY IN A DISCRETE TRACKING TASK.
Daniel L. Baty (NASA, Ames Res. Center, Moffett Field, Calif.).
Psychonomic Science, vol. 7, Mar. 15, 1967, p. 283–284.

Six subjects performed a self-paced, random-input, discrete tracking task in one and two dimensions by quickly touching well defined lighted areas with a stylus. An index of task difficulty was computed for each of 14 experimental conditions. Performance in terms of information-processing rate was shown to be primarily determined by the degree of task difficulty and the number of target alternatives.

A67-81240
CONTINUITY OF EXPOSURE LENGTH EFFECTS IN TACHISTOSCOPIC PERCEPTION.
Beth Raymond and Murray Glanzer (N. Y. U., New York City).
Psychonomic Science, vol. 7, Mar. 15, 1967, p. 287–288. 6 refs.
Contract DA-49-193-MD-2496.

It has been claimed that the number of units reported by subjects remains invariant over the range of exposure durations 15 to 500 msec. Four sets of observations under various experimental conditions were carried out to test this claim. The results are univocal: there are continuous, systematic increases in number of units reported with increase in exposure duration.

A67-81241
EFFECTS OF STIMULUS SIZE, BRIGHTNESS AND COMPLEXITY UPON EEG DESYNCHRONIZATION.
Garry Baker and Robert Franken (Calgary U., Canada).
Psychonomic Science, vol. 7, Mar. 25, 1967, p. 289–290. 6 refs.

Measures of duration of electroencephalogram (EEG) desynchronization were taken while subjects were exposed to a series of slides varying in complexity as well as size and brightness. There was a positive relation between duration of EEG desynchronization and level of complexity but no effect due to size or brightness. Significant habituation to temporal as well as spatial aspects of complexity were observed.

A67-81242
NONMOTORIC INFLUENCES OF MEPROBAMATE ON ESTABLISHED SHUTTLE SHOCK-AVOIDANCE PERFORMANCE.
Robert P. Caruthers (Ky. U., Lexington).
Psychonomic Science, vol. 7, Mar. 25, 1967, p. 291–292. 6 refs.

Meprobamate was shown to effect shock avoidance in two detrimental ways. Trained rats under drug influence show agitated disorientation and avoid less frequently than placebo controls. These effects remain for 30 min. to an hr. after motor complications characteristic of the drug are no longer measured.

A67-81243
AVERAGED OCCIPITAL RESPONSES TO STIMULATION OF SITES IN THE NASAL AND TEMPORAL HALVES OF THE RETINA.
Robert G. Eason and Carroll T. White (San Diego State Coll. and Navy Electron. Lab., Calif.).
Psychonomic Science, vol. 7, Mar. 25, 1967, p. 309–310. 9 refs.
Grants NSF GB-231 and NSF GB-4067.

Responses of the right occipital lobe to flashes imposed on the nasal retina of the right eye were smaller than responses to flashes imposed on the temporal retina. Since reaction times are shorter to nasal than to temporal stimulation of the retina, the above result is inconsistent with existing evidence for an inverse relation between evoked response amplitude and reaction time. The inconsistency may be related to the fact that the right occipital lobe receives no projections from the nasal retina of the right eye.

A67-81244
THE ELECTRORETINOGRAM EVOKED BY THE EXCITATION OF HUMAN FOVEAL CONES.
T. S. Aiba, M. Alpern, and F. Maaseidvaag (Mich. U., Ann Arbor).
Journal of Physiology, vol. 189, Mar. 1967, p. 43–62. 21 refs.
Grant NIH NB 01578.

A 2° test stimulus foveally fixed and viewed against a blue background (40° in extent and producing 2.0×10^4 scotopic td of retinal illuminance) evokes a small voltage which can be recorded from the human eye with a conventional contact lens electrode if the test stimulus is flashed at a rate of 15 c.p.s., and the responses to at least several hundred flashes are averaged. The action spectrum of the response obtained in this way agrees reasonably well with the observer's psychophysical foveal luminosity curve. For the peripheral retina, the action spectrum is similar to that of the fovea when allowance is made for differences in screening macular pigment. Such responses diminish when the test stimulus is focused on the peripheral retina and disappear when the test light is focused on the blind spot. Therefore, the response to the test light fixated centrally is the result of the excitation only of cones mainly, if not exclusively, in the fovea. When the intensity of the background is reduced by a factor of ten, the action spectrum shows evidence of the effect of excitation of rods in the blue part of the spectrum and of cones in the red. These red and blue responses add linearly when combined together, provided they are adjusted to coincide in phase.

A67-81245
MECHANISM OF STIMULATION OF AORTIC CHEMORECEPTORS BY NATURAL STIMULI AND CHEMICAL SUBSTANCES.
A. S. Paintal (Delhi U., V. Patel Chest Inst., India).
Journal of Physiology, vol. 189, Mar. 1967, p. 63–84. 39 refs.

Impulses were recorded in single fibres of aortic chemoreceptors of cats anaesthetized with chloralose. There was no demonstrable difference between the responses of the endings of medullated and non-medullated fibres to natural stimuli. Most of the endings were practically silent while ventilating the lungs with air. The maximum frequency of discharge while ventilating the lungs with 4% O_2 ranged from 1.5 to 24 impulses/sec.; in 21 out of 26 endings it was less than 12 impulses/sec. All the chemoreceptors tested were considerably stimulated following administration of 0.2 or 2% CO at a time when O_2 content was greater than 4 ml./100 ml. All the chemoreceptors were markedly and rapidly stimulated following circulatory arrest while the cat was ventilated with air. This stimulation fell considerably within three min. of circulatory arrest. Little or no excitation followed circulatory arrest while ventilating the cat with pure N_2. These results suggest that excitation following circulatory arrest is not produced by a metabolite. There was a remarkable difference between the sensitivities of endings of medullated

and non-medullated fibres to drugs. The former were either unaffected by relatively large doses of acetylchloline (ACh) or phenyl diguanide, or if stimulated, the excitation produced was much less than that produced in endings of non-medullated fibres. This supports the hypothesis that drugs produce their effects by an action at regions where the nerve impulse is initiated. It also indicates that ACh is not likely to be a transmitter in the normal processes of excitation of chemoreceptors. A mechanism of stimulation of chemoreceptors not involving metabolites was presented.

A67-81246
AUDIOMETRIC STUDIES ANSWERING THE QUESTION: DO WE HAVE TO EXPECT PERMANENT DAMAGES IN THE MILITARY SERVICE AS A RESULT OF TRAUMA CAUSED BY DETONATIONS? [AUDIOMETRISCHE UNTERSUCHUNGEN ZUR FRAGE: KANN MAN MIT KNALLTRAUMATISCHEN DAUERSCHADIGUNGEN WAHREND DES WEHRDIENSTES RECHNEN?]
M. Hülse, C. J. Partsch, and W. Schweizer (Saarlandes U., U. Hals-Nasen-Ohrenklin., Homburg/Saar, West Germany).
Wehrmedizin, vol. 5, no. 11/12, 1966, p. 217–225. 26 refs. In German.

Soldiers (708) were given an otologic and audiometric examination. It was found, that 190 of them showed unilateral or bilateral changes of the tympanic membrane as a sequela of otitis media in the past. The changes of the tympanic membrane had no essential influence on the hearing accuracy as seen in the audiometric tests. Eight weeks after a shooting practice at a troop range area a shifting of the auditory threshold was noted. Especially remarkable was the auditory loss of more than 30 db. in the various measuring frequencies. In soldiers with long term duty (instructors) we have to expect a permanent hearing damage which may even reach the scope of duty disability, if protective measures against the noise are not observed.

A67-81247
RELATION OF LATENCY OF GALVANIC SKIN REFLEX TO FREQUENCY OF THE ELECTROENCEPHALOGRAM.
Walter W. Surwillo (Louisville U., School of Med., Ky.).
Psychonomic Science, vol. 7, Mar. 25, 1967, p. 303–304. 12 refs.

Galvanic skin reflexes (GSR) were evoked in 42 healthy males by short, supra-threshold tones presented at random and without warning while electroencephalograms (EEG) were recorded. Period (reciprocal of frequency) of EEG, in the interval between presentation of stimulus and initiation of GSR, was correlated with GSR latency. A statistically significant but low positive correlation of 0.26 suggested that, in contrast to results with voluntary responses, latency of GSR is largely independent of cortical (EEG) influences.

A67-81248
A SOCIAL SYSTEM MODEL FOR SPACE TRIPS TO MARS.
S. B. Sells (Tex. Christian U., Fort Worth).
Yale Scientific Magazine, vol. 41, Feb. 1967, p. 20–21, 24.

A preliminary version of a social system model for spacecraft is proposed which is linear and does not account for observable interdependencies for differential weighting of components, or of varying system states. The microsociety model involves the following major categories, each of which is represented by a pattern of quantitative or categorical variables: (1) objectives and goals (polarization, remoteness, success criteria of goal attainment, uncertainty of mission success); (2) philosophy and value systems (obedience to command, mission emphasis, respect for individual lives, national priority, military tradition in personal attitudes, conformity with dominant mores and values of society); (3) personnel composition; (4) organization; (5) technology; (6) physical environment; and (7) temporal characteristics. The study of system structure of microsocieties demonstrates that a standard set of variables can be devised and resonably applied to compare various microsocieties.

A67-81249
ADAPTATION TO 23 1/2-HOUR FOOD DEPRIVATION UNDER TWO CONDITIONS OF REINFORCEMENT.
Sherwood O. Cole and Tom Allison (Rutgers U., New Brunswick, N. J. and Wash. State U., Pullman).
Journal of Psychology, vol. 65, Mar. 1967, p. 169–175. 7 refs.

After initial bar-pressing training, 16 hooded rats were assigned to two reinforcement conditions (CR or FR). Adaptation measures were taken for 12 successive days under conditions of cyclic 23 1/2-hour food deprivation. The results indicated a significant difference in number of bar presses and food consumption for the rats under the two conditions. The significant Reinforcement Groups x Successive Days interaction effect on bar pressing also indicated that the rate of adaptation for the two groups differed. Since the CR animals appeared to adjust in nine days (in contrast to previous findings of 15 to 18 days under comparable deprivation conditions), it was suggested that the present rats benefited from previous training on the adaptation task. The need for further studying the relationship of training and adaptation was stressed and the value of an interactive approach to the study of adaptation indicated.

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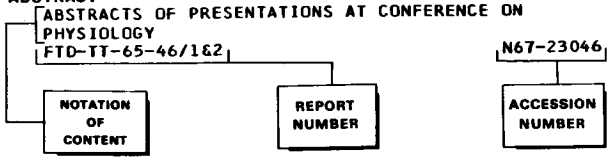

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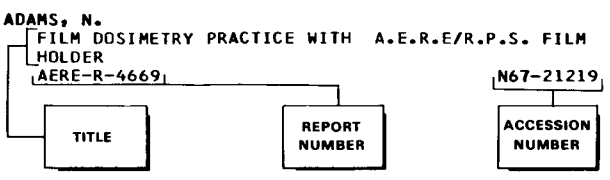

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